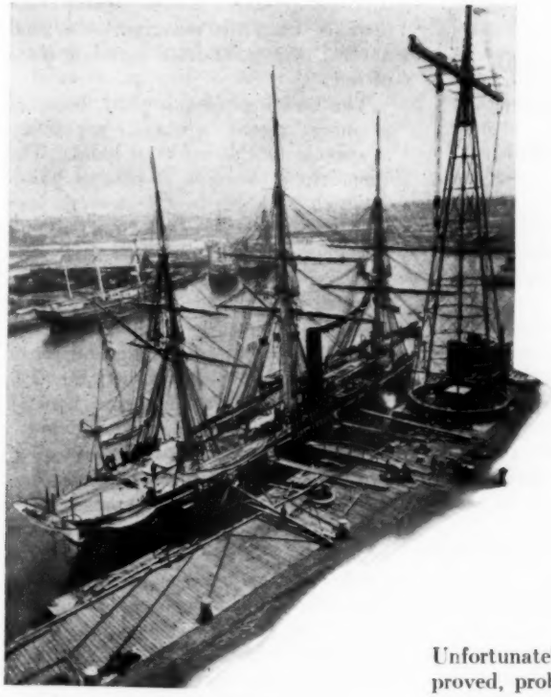
American Machinist

JANUARY 15, 1936



New York Navy Yard—1878

OUR NAVY YARDS

ROBERT J. WALKER

Lieutenant Commander, United States Navy

TODAY our Navy Yards are not only taking care of the repair and upkeep of 169 vessels in active commission but are in the process of laying down and building 47 ships which ultimately will cost in round figures $228,000,000. Because of this heavy work load the plant equipment of the various yards is being taxed to the limit, a limit that causes those responsible for output considerable concern.

After the passage of the "four point eight" bill a request was made on the Federal Emergency Relief Administration to set up a project for the purchase of $24,663,880 worth of machine tools to rehabilitate the various naval shore stations. Had such a sum been appropriated the average age of equipment ashore could have been reduced from nineteen years to approximately ten years. Much of the old and obsolete equipment which is so costly and slow to operate, to say nothing of its inaccuracy, could have been replaced. Unfortunately this sum was never approved, probably because the cost per man per year for building machine tools was too high. Cost figures based on FERA instruction amounted to $21,343 per man per year, those on Department of Commerce statistics $1,720 per man per year. Neither of these was low enough to come under the $1,370 per man per year to give 3,500,000 men employment with the $4,800,000,000 appropriated for relief by Congress.

In contemplating an inspection of the machine-tool equipment at the navy yards in the summer of 1935 the Navy Department was most fortunate in obtaining from the Department of Commerce the services of R. E. W. Harrison, then in charge of the Machinery Division of that Department. Having obtained his services, the Navy Department ordered an inspection of the machine-tool equipment at the continental yards beginning in June of 1935. The inspecting party in general consisted of R. E. W. Harrison, Lieut. Commander Robert J. Walker, U.S.N. (officer-in-charge of machine tools and manufacturing section and representative of the Bureau of Engineering); Lieut. Commander DeWitt C. Redgrave (C.C.) U.S.N. (assistant to officer-in-charge and representative of the Bureau of Construction and Repair); and Eugene G. Herndon, senior mechanical engineer, Shore Establishments Division (machine tools).

From orders and conferences held prior to the inspection trip it was understood that the Department desired to accomplish the following with respect to machine-tool equipment and its operation.

1. Maintain machine tools in all yards to a standard that would insure:
   (a) Sufficient number of each type of tool to handle work load required or in prospect.
   (b) Accurate machining.
   (c) Economy in production.
   (d) Safety in operation.

2. Maintain personnel in all yards to a standard that would insure:
   (a) An up-to-date knowledge of the art of working materials.
   (b) Intelligent use of equipment.
   (c) Economic use of equipment.

Basing on these instructions the inspection was made in as much detail as time permitted. The yards prepared themselves for the visiting party in the same manner as outlined under, "When the Fleet Comes In" (*AM*—Vol. 78,

page 861). In passing it is well to mention that conditions as illustrated in that article have not changed materially.

THE FIRST navy yard visited was Portsmouth, named after the town lying directly across from it on the mouth of the Piscataqua River. The old and rugged granite buildings of the yard took us back to the days of 1820-40, when men were men and work during the winter months began one hour after sunrise and lasted until sunset with one hour for dinner, and in the summer began at six a.m. and lasted until six p.m. with an hour out for breakfast and dinner. Then men were only excused from work when the black ball on the flag pole showed that the temperature was 5 deg. or more below zero. The daily rate of pay in those days varied from a minimum of $1.00 to a maximum of $1.75.

The men of this locality have been building boats ever since 1645. It is little wonder that they take such a great amount of interest in their work. It is born in their blood. Today the building of our government constructed submarines is turned over to their careful workmanship. The various and sundry electrical fittings used throughout our service are made here. What a surprise John Paul Jones would have had when he was fitting out the *America* at Portsmouth in 1781 if he had seen the electrical running lights they are now turning out in this yard.

In proportion to the age of the buildings, the equipment at Portsmouth was found to be about as old, averaging over eighteen years. Outside of welding equipment their greatest need was for such tools as an openside planer, a boring mill and engine lathes.

At the Boston yard we found them engaged in building four destroyers. The rope walk built in 1836 with its machinery, average age 32 years, astounded us. The men in the structural shop were busy in working out their never-ending jig-saw puzzle of how to maneuver large plates from one machine to another without hitting the uprights or supporting columns of a building which was designed back in the days of wooden ships. The average age of equipment in here we found to be 21 years, which is older than at other yards, probably because of a lesser need for equipment since the war than in our west coast yards which have been kept busy repairing the fleet.

The navy yard at Boston also started as a naval base in 1800 when the government purchased some 65 acres of ground at the confluence of the Charles and Mystic Rivers on land formerly known as Moulton's Point. A drydock built of granite was started in this yard in 1827. Its first ship was the *Constitution (Old Ironsides)*, June 24, 1833.

Our next stop was at the navy yard, New York, over on the Long Island side of the East River near the Brooklyn Bridge. It is one of the most historic, important and interesting spots in greater New York, yet it is safe of say that the great majority of the dwellers of the metropolis have never visited it.

The first piece of property for this navy yard was purchased in 1801, about thirty acres for $40,000. In 1806-7 the present Commandant's house was built. Unfortunately for many of the shops, the buildings which house them were built before the Civil War and as a result are entirely unsuited for the work being undertaken in them. No appreciable sum has ever been appropriated at one time for the complete rebuilding and rearrangement of buildings in this most important yard. The equipment of the machine shops, the largest of any in our navy yards, is a disgrace to the beautiful skyscrapers which shield it from the setting sun. Imagine trying to build large diesel engines and powerful turbines in a shop where the machine tools average nineteen years of age.

At this point it is well to quote one sentence from Mr. Harrison's report upon the completion of the first three yards: "Evidence grows of the desirability of a thorough clean-up of all old buildings and equipment, yard by yard."

The inspecting party's report recommending $2,500,000, each year for five years, for machine tool replacements for all Navy Yards, is certainly conservative—[Editor]

LEAGUE ISLAND, in the Delaware River, is the site of the Philadelphia Navy Yard. The entire island, originally a marsh flat but now raised and inclosed by dykes, was purchased in 1863 by the city of Philadelphia for $430,000 and tendered as a free gift to the United States. Because its acceptance by the government would have affected the interests of other places which hoped to be selected, it was vehemently opposed. However, in the end the case was made so clear that on December 3, 1868, the Secretary of the Navy, under authority of Congress, formally accepted the site. Today it is the nearest yard to the center of the steel industry. Its long water route distance from the sea gives it a good natural protection from invading men-of-war.

The buildings of this yard, being of a more recent vintage, are more adaptable to the work on hand. The Philadelphia Yard is at present building two cruisers, two destroyers, and four cruising cutters, a load which employs every tool available.

Going down the coast we found the Norfolk Navy Yard, located at a place known in the early days as Gosport, Va. No naval shipbuilding and repair base belonging to the United States is more important than this one. Located near enough to the entrance of the Chesapeake Bay to be easily accessible, it is, at the same time, in a position readily defended from attacks either by land or by water, and, as has been repeatedly shown, can be held by a small force against a very superior one. Such is the mildness of the climate that work of all sorts can be carried on at all seasons of the year without interruption. Hampton Roads, the outer harbor, is an excellent point of rendezvous for a fleet or squadron.

Just before the breaking out of the War of the Revolution the British established a marine yard for the use of their navy on the site of the present navy yard at Gosport, now part of Portsmouth, Va. It is stated in a letter, now on file in the Navy Department and written in 1824 by Miles King, United States navy agent, that this site was selected after a careful survey of all the ports within its dominions in North America, as the most eligible situation for a naval station. The name of Gosport was doubtless taken from Gosport, near Portsmouth, England, where one of the most important of the British dockyards is located.

Mr. King's letter further states that scarcely had the British government commenced the works when the Revolution began, and the yard, together with the adjoining property of Andrew Sprowle, the British navy agent, was confiscated and forfeited to the State of Virginia.

By 1799 the Gosport Yard had become so well established that the

Secretary of the Navy resolved to make it one of the permanent navy yards of the country. At his suggestion the Legislature of Virginia, by an act dated January 25, 1800, ceded to the United States the property known as Gosport for the purpose of establishing a navy yard there.

Today many of the old original granite and brick buildings are still standing. Although these old structures are widely separated from the new foundry, sheet-metal shop, machine shop and structural shop, they still have to be used to house the administration offices, paint shop, and other minor shops.

AT CHARLESTON we found the navy yard engaged in building a 2,000-ton gun boat and a coast guard cutter, with hopes of being given a destroyer to build in the fall. (This wish has been granted.) The personnel's determined desire to overcome all obstacles will no doubt enable them to do a good job with the scanty equipment available for such purposes at this yard.

On our visit to Mare Island we found the same condition existing as at Norfolk—the main shops widely separated from each other and from the administration building.

Mare Island and Puget Sound being the closest to the fleet have the heaviest work loads of any of our navy yards, and have had since about 1925. As a result their requests for new equipment have been given more favorable consideration. Undoubtedly these two yards are the best equipped of any, with Puget Sound leading as the best laid out yard, its activities all being centralized about its docks and fitting out piers.

Being the only two yards on the west coast, and both situated on large landlocked bodies of water, their natural location is of extreme importance.

The management and personnel of both of these yards, although separated by many miles from our industrial centers, are alert to advantages of new processes and improved technique in the working of materials.

To perfect the layout of new buildings in our navy yards and the equipment in these buildings it might be well to adopt a policy similar to that of the Santa Fe Railroad which has some of the best railroad shops in the country.

Along this line it has been suggested that our ten navy yards be divided into two groups of five each, the principal yards in one group and the secondary or smaller in another. Instead of the navy yards having monies for remodeling old buildings, building leantos and buying new equipment distributed more or less evenly among them each year, that each five years, after careful planning, the total five-year accumulated money for buildings and equipment be spent in one major yard and one minor yard in rotation.

The inspection trip, besides enabling the board to recommend a list of $1,700,000 worth of machine tools, which sum was appropriated by the last Congress, definitely showed that the $1,500,000 per year expenditure for machine tools as approved in 1930 is insufficient. As a result the following recommendation was made to the Assistant Secretary of the Navy.

"Good commercial practice calls for a ten per cent yearly replacement of machine tools. Such a program results in equipment having an average age of five years. This report shows the average age of machine tools in the continental yards to be 19 years, and that as such they are too old and as a result will not turn out work accurately and economically. The past yearly expenditures have been insufficient. The art of building ships and parts of ships has changed radically. The yards are struggling under a heavy building program to turn out accurate work with poor and obsolete equipment. Instead of recommending a yearly replacement of $1,500,000 as heretofore, it is recommended that the yearly replacement of machine tools be increased to not less than $2,500,000 for a period of five years (fiscal years 1937, 1938, 1939, 1940 and 1941) for all navy yards, with the exception of Washington which does not come under the cognizance of the Bureaus of Construction and Repair and Engineering. (The backlog of $2,017,305 unappropriated money since 1930 should be added to the annual request for 1937). Such a program, if carried out indefinitely, would result in each tool having an average age of over fifteen years before being replaced, a period really too long. At or before the expiration of this five-year period, the yards should again be surveyed with respect to equipment and work on hand or in prospect and the replacement program revised accordingly."

MR. R. E. W. HARRISON'S report, which brought many new points to light and which was greatly appreciated by the Department, carried further specific recommendations as follows:

To a mechanical engineer the outstanding characteristic of the modern ship is the ever-increasing accuracy of fabrication, this applying in varying degrees from the firing and steering control apparatus, all the way down the line to the engine room, and even to the hull itself. By accuracy is meant the control of dimensions within close limits of size. Without exception this accuracy is dependent on two factors; first, the machine tools used to effect fabrication and, second, the human element which uses the machine tools and the hand-operated measuring tools.

An unmistakable tendency is apparent—the requirements in the way of accuracy are following a well-defined trend and the equipment of the immediate and distant future will impose a greater demand than before; hence it is imperative that both the machine and human elements be prepared to meet and, if possible, anticipate this demand.

Portsmouth Navy Yard—The ship shed at the left is still standing

If the foregoing basis of thought is accepted, the following conclusions appear to be inescapable:

1. Machine tools of the finest quality which the country can produce are none too good for the service which is demanded of them.
2. Tools of secondary quality or tools which have become inaccurate, through due or undue wear, can only be used when the personnel is skilled enough to inject the required degree of accuracy by hand;

an extremely slow and disproportionately expensive process.

3. While it is not economically feasible to use the type of machine tool which is used in mass production industry, it is necessary that the machine tools which are used in both shore and floating establishments be of such productive efficiency that they will meet the needs of each individual case in respect to the time required to do the work, i.e., economically in time of peace, and expeditiously and reliably in time of emergency.
4. The machine-tool equipment of the United States Navy Yards is inadequate in quantity, and difficulty is experienced in meeting shipbuilding schedules because there is in all shops a shortage of essential tools.
5. An extremely large proportion of the equipment in use is obsolete, because of its age. During the intervening period the original accuracy characteristic has been lost, and in many cases it was never possessed in the degree required today.
6. Developments which have taken place in respect to technique have in many instances brought about an entire change in the methods of fabrication on parallel work in commercial establishments, i.e.:

   Welding as against riveting.
   Grinding as against turning.
   Milling as against shaping.
   Broaching as against milling and shaping.

In a number of instances metallurgical advances have made desirable the use of different methods and tools. For instance, the present availability of the tungsten and tantalum carbide cutting elements which are capable of removing metal at rates 3 to 4 times those possible on comparable work when using high-speed steel.

The net result is that while the final results as now obtained are acceptable and in accordance with specifications, the time and skill elements are overemphasized, costs are higher than they might be if more modern equipment were used, but what is probably of greater importance from the purely military point of view, *there exists an unnecessarily high degree of hazard*, which quite conceivably might assume serious proportions if the yards should, as they undoubtedly will some day, be faced with a military emergency.

7. There is an inevitable tendency in all establishments (civil and otherwise) where the supervisory element has little contact with competitive enterprise, for an atmosphere of undue conservatism to prevail and this invariably expresses itself in a slowness to adopt new methods as and when they become available.

It is suggested that the most effective way of remedying these conditions is by the educational process, i.e., more contact with competitive industry, plus a policy of encouragement at headquarters, which will serve as an inducement to all supervisors to request this more up-to-date equipment.

8. The foregoing suggestion, however, is not the complete answer inasmuch as the need is apparent for a greater degree of appreciation of managerial responsibility on the part of all concerned and to meet this situation it is suggested that a scheme of systematic foreman and supervisors' training be installed similar to that which has been so successfully installed by the General Motors Corporation.
9. While the influence exercised by the Officer Personnel at the yards is wholly good, it is impossible for the urge for, and conception of, an improved manufacturing technique to come from this element under the present system of rotative appointments.

It is the writer's belief that it would be in the interests of the Department for a section of the Officer Personnel to be suitably trained on a professional basis and then permanently assigned to meet this professional requirement.

10. Having regard to the speed at which the technique of manufacfacture is changing, as well as the rapid evolution which is occurring in the methods and material of modern warfare, the fact becomes patent that not only the maintenance, but also the improvement of the machine-tool equipment in shore establishments should be a continuing activity.

With this thought in mind the writer, therefore, recommends that a regular yearly appropriation be made to be used exclusively for new machine-tool and work-processing equipment, this appropriation being on the same regular and undisputed basis as that which is devoted to the payment of salaries. Without continuity of effort in the direction of improvement of technique, costs are increased disproportionately and, furthermore, a situation is likely to be engendered which, in the event of a national emergency, would prove a definite handicap.

11. One of the regulatory paragraphs appended to all Navy Department appropriations precludes the use of time-study equipment such as that which is used in commercial establishments.

Such restriction imposes on the officials responsible for efficient production a handicap, and deprives them of a tool of management for which there is absolutely *no* effective substitute.

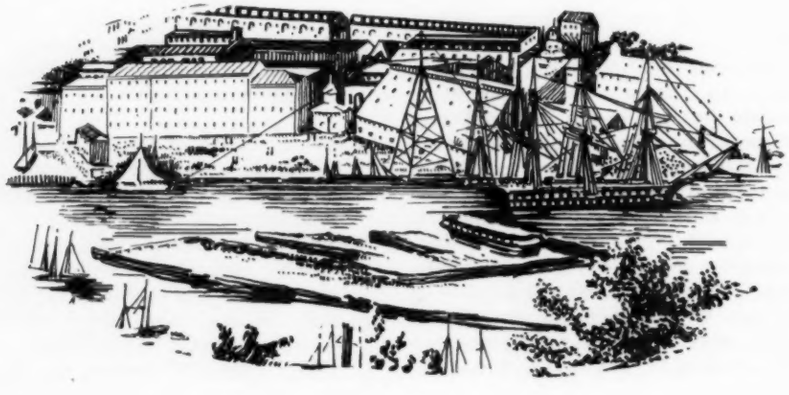
It is, therefore, recommended that in future this restriction be deleted from bills dealing with appropriations, and management personnel be instructed to estimate and allocate times along lines similar to those employed when comparable work is undertaken in private enterprises.

12. In well-managed commercial organizations it is the almost invariable practice for the maintenance department to record in simple log form on cards bearing the plant number of the respective machines, a statement of the cost involved in hours of labor and material provided necessary to keep individual machines in service.

This record serves a number of useful purposes, chief amongst which are guidance when purchasing new equipment, efficiency of machine operator, and adequacy of supervision.

It is recommended that a similar inexpensive and simple system be made part of the regular routine at each Navy Yard. (This practice is now being followed at the Mare Island Yard.)

New York Navy Yard—1833



A "BREAK" GOT THE ORDER

But it took planned modernization to make sure of repeat business

ROBERT B. SMITH

Assistant to the Administrator, Federal Housing Administration

THE importance of modern machinery and equipment in enabling comparatively small firms to compete successfully with larger and better known corporations is well illustrated by the contract which the Screw Machine Products Company, of Milwaukee, made recently with a local automobile body concern. The largest order in the history of the company's brief but rapid rise in the automotive industry was obtained after several unsuccessful attempts to land the same contract, mainly because of the addition of new machinery.

Each year, for three successive years, H. A. Miller, president, bid for the order which called for several million auto body units. Prices and other terms were in keeping with those offered by competitors, but the contract was always awarded to a larger and better known firm. Mr. Miller inquired why he had not been successful. He was told his concern was believed to be too small to handle the job.

Invitations to visit the plant that its efficiency and capacity might be proved was refused. So Mr. Miller, in preparing his fourth annual bid, gave production possibilities considerable study in the hope that some factor he had previously overlooked might be stressed to advantage. He found that business had grown to a point where regular orders almost taxed to the limit the somewhat obsolete equipment and that, if he did land the contract, it would necessitate neglecting other customers.

Modern, high-speed, automatic machinery appeared to answer his problem; but installation of new equipment, unless he landed the large order, meant a potential loss. While trying to decide what to do, Mr. Miller was called to the office of the automobile body concern. Something had happened in the factory making the parts he would soon bid on, and he was asked if he would help until the trouble had been straightened out.

"This was the 'break' we needed," said Mr. Miller. "We were not geared to make the units, but we dropped all other work and got busy. It was our chance and we made the best of it, filling the order well in advance of the agreed time."

Having proved the ability of the Screw Machine Products Company to handle the work, it was more or less a routine job to land the contract. And since then Mr. Miller has several times demonstrated that the proximity of his plant is an asset because he can turn out rush jobs on short notice. Because of this service little trouble is expected in holding the order which resulted in the installation of four new automatic machines and the addition of 30 per cent more help.

"This new contract means more than filling our biggest order," continued Mr. Miller. "The new machinery is capable of turning out more work than required, so we are now in position to expand further. Then, too, making good hasn't hurt our reputation.

"Already the Screw Machine Products Company has shown a ten to fifteen per cent increase in business due to the more modern equipment and our plant has a capacity for about as much more new production without the addition of more machinery or men."

ADVANTAGES which concerns like this enjoy in soliciting new business stresses the general obsolescence of equipment and machinery in all lines of industry. Surveys by industrial organizations and business magazines indicate that there have been very few new installations in the past five years.

Helpful in correcting this situation is the plan operated under the National Housing Act, enabling owners and operators of factories, industrial plants and general business to borrow from private financial institutions up to $50,000 for the purchase and installation of new machinery and equipment or for plant improvements, alterations or additions. The Government does not lend any money. The Federal Housing Administration insures banks and other financial agencies against loss up to 20 per cent of their total modernization and repair notes.

A new booklet, "Equipment and Machinery Eligible for Modernization Credit," published by the Federal Housing Administration may be obtained from the offices at Washington, D. C. This literature contains a résumé of Class A loans, as covered by the amendment to the National Housing Act, as well as a partial list of items eligible for government-insured financing.

Since modernization credit may be used for financing plant improvements and the purchase of machinery and equipment, many firms are also using it to help sales. Salesmen and agents have been advised of the products eligible for government-insured loans, thus facilitating contracts which otherwise might be delayed until special rulings on eligibility are obtained.

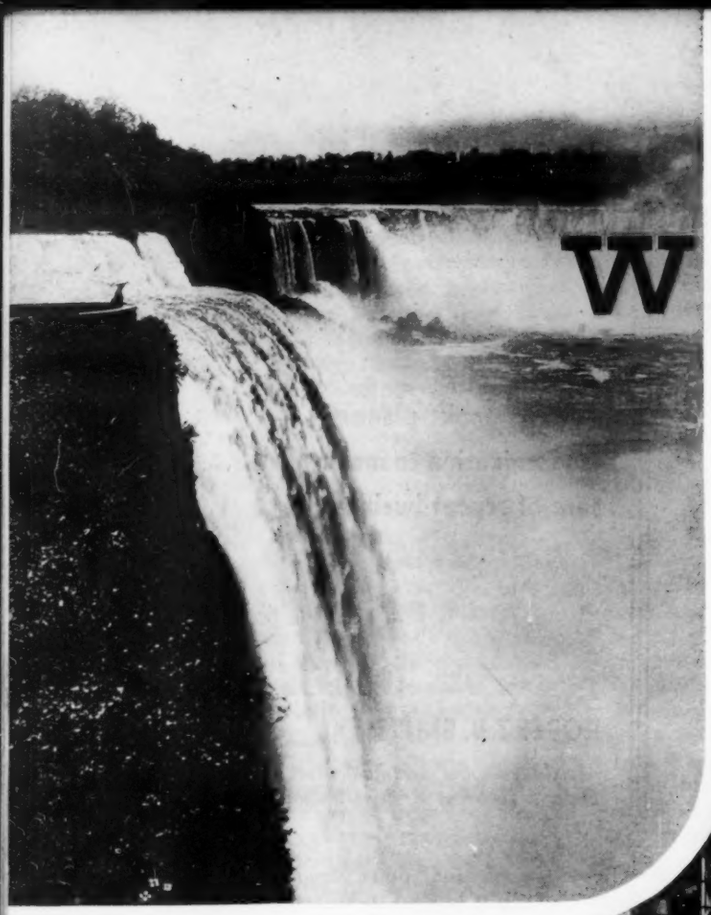
Stainless Steels

Stainless steels are classified into three groups, according to W. J. Prestly, vice-president of the Electro Metallurgical Company.

One is steel with from 4 to 7 per cent chromium, either with or without such additional alloys as molybdenum or tungsten.

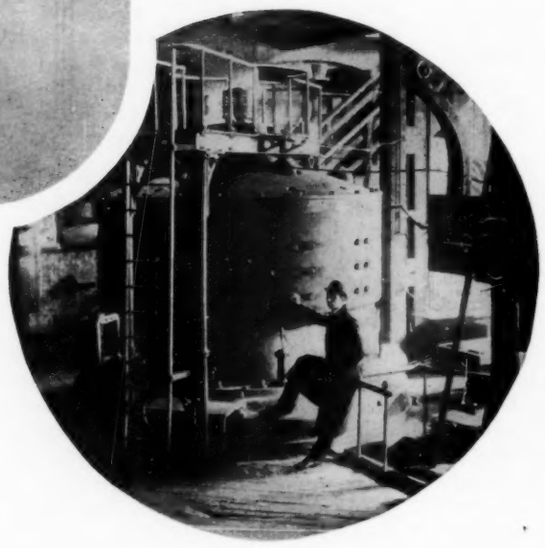
Another contains from 12 to 30 per cent of chromium without other alloy.

The third has from 18 to 30 per cent chromium and from 8 to 12 per cent of nickel.



WESTINGHOUSE

Hardest in any century are the first 50 years. The hard half over, this manufacturer looks ahead to many electric decades to come



Though leading scientists of the day pronounced the a.c. system impossible for Niagara, Westinghouse built the 5,000 hp. generators first used there and still operating

WITH seven of his associates, George Westinghouse was granted a charter to manufacture electrical products on January 8, 1886, under the name Westinghouse Electric Company. Operations started the following March in a small factory building situated in downtown Pittsburgh.

There were 200 employees on the first payroll, thirteen products on the first price list. Sales representatives were located in only five cities; nine months' sales (April 1 to December 31, 1886) totaled $142,000.

Today Westinghouse securities are held by more than 50,000 stockholders, manufacturing operations are carried out in nineteen works. Normally, employees average 43,000, annual sales $180,000,000.

Once formed the new company turned to the development of alternating current for the generation, distribution and application of electricity. Based upon certain patents, this work resulted in the perfection of the a.c. transformer. Early in 1886, experiments progressed to a point where an a.c. system was successfully used to light stores and streets in Great Barrington, Mass. By November the company installed the first commercial a.c. lighting system in Buffalo, N. Y.

Next in importance was the contract awarded Westinghouse to light the World Columbian Exposition (Chicago, 1893). This job involved the manufacture of 250,000 of the famous "stopper lamps" and the installation of a.c. machinery to supply power for them.

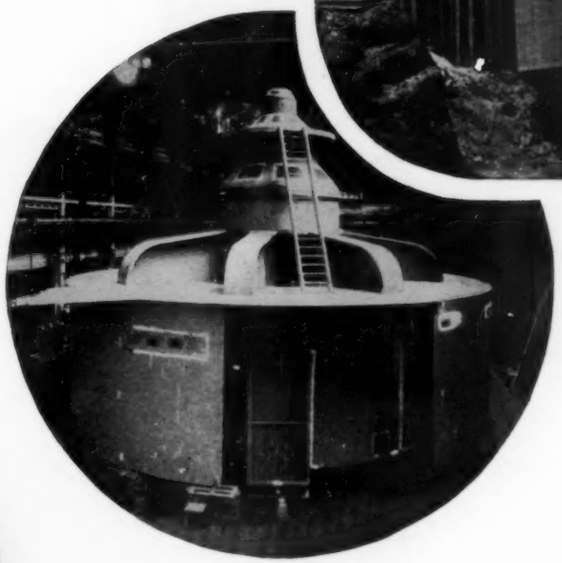
At the same exposition, Westinghouse showed, for the first time, a complete polyphase a.c. current system of power generation, distribution and motorization. It prepared the way for the introduction of the induction motor, first offered for commercial use in 1894. This motor expanded the use of a.c. current beyond the field of lighting to include power applications. Within 20 years from its introduction the motor had practically supplanted all other forms of power drive.

Forty years after the Columbian Exposition, Chicago held the Century of Progress. This time the buildings were painted by light; illumination was treated as an element in architectural design, used to emphasize lines of buildings, to color walls and facades, to brighten grounds and roadways.

Demonstration of the successful polyphase current system at the '93 exposition influenced the assignment to Westinghouse of a contract to install equipment at Niagara Falls. Many times larger than any electrical units previously built were the 5,000-hp. machines installed there in 1895. Still there, they are ready for use as part of the station's standby service.

Introduction to America of a new type of turbine in 1899 formed another of the company's pioneering achievements. Using this unit as a prime mover, 400-kw. machines were first built. In 1900 a steam turbine was

FINISHES 50 YEARS



In 1935 two of the largest generators in the world were built for Boulder dam; here is one of these 82,500-kva. units with a view of the upstream face of this great water power development. Below — Vertical transportation has reached its highest speed in the Westinghouse elevators installed in Radio City, Rockefeller Center, New York

built and installed at Hartford, Conn., rated at 2,000 kw., which revolutionized the existing methods of electrical generation from coal. The success of this venture quickly led to the building of 5,000, then 10,000 and 20,000 kw. units.

New horizons in power had become possible. As an example of the steady increase, Westinghouse in 1935 installed at the Richmond station of the Philadelphia Electric Company a single-shaft unit rated at 183,333 kva., the largest of its type ever built. It fits into the space arranged several years ago to hold a unit of a third the capacity of the present machine.

The list of Westinghouse pioneering achievements is long. Some of the company's most significant contributions appear in the accompanying list.

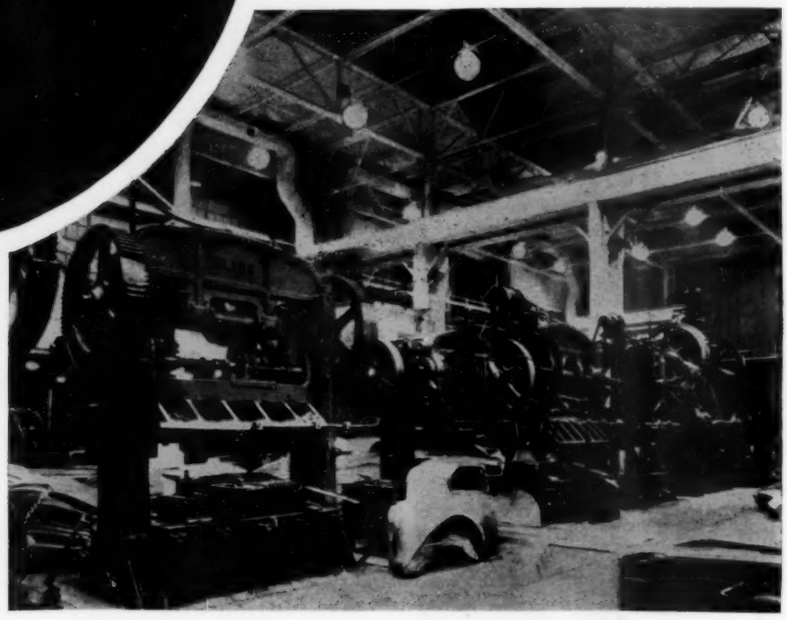
Factories today are equipped for high speed production where close limits are obtained through electric drive and control. Electricity made possible the multiple-process machine, individual drive, present-day welding practices.

It has created new standards for rail transportation, exemplified in the recently completed electrification of the Pennsylvania Railroad between New York and Washington. Diesel-electric trains are now in service on many roads. Street railways and subways did their part in building up the urban population; elevators make the modern skyscraper possible.

Homes are being improved by a wider use of electrical facilities. In this

For fabricating buildings and machinery electric arc welding has established itself as a versatile and indispensable tool

Many effective applications of industrial lighting are typified by this view of the press shop of the Briggs Manufacturing Company



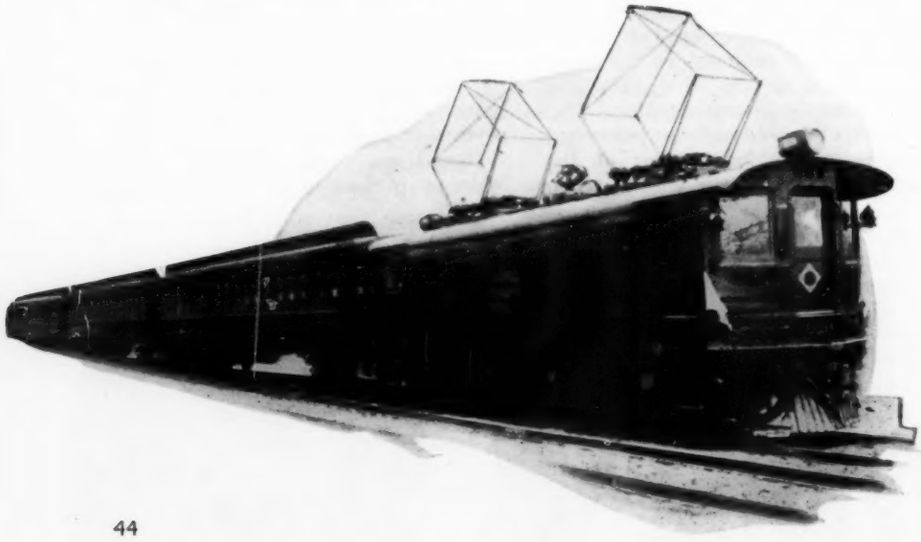
field electrical manufacturers seek their next great market.

Radio created a new medium for mass communication, built new industries. Today it may link the world for a single broadcast, guide the aircraft along their lanes, or serve as an effective check on crime.

In all this activity Westinghouse has participated. The company on November 2, 1920, established its first station, KDKA, to broadcast regular programs. From that start grew the great broadcasting systems. Westinghouse still operates its radio stations, three in number, but now in addition repeats programs on short waves to reach nearly all civilized lands.

A short time ago the company's en-

When the New York, New Haven and Hartford railroad began using electric locomotives in 1906 it was the last word in main-line electrification



Significant Dates

1886—Charter granted for Westinghouse Electric Company . . . First a.c. station put in operation.

1893—Lighted World Columbian Exposition at Chicago.

1895—Installed the first great power plant at Niagara.

1899 — Introduced the Parsons steam turbine and built the first commercial turbine generator in the United States.

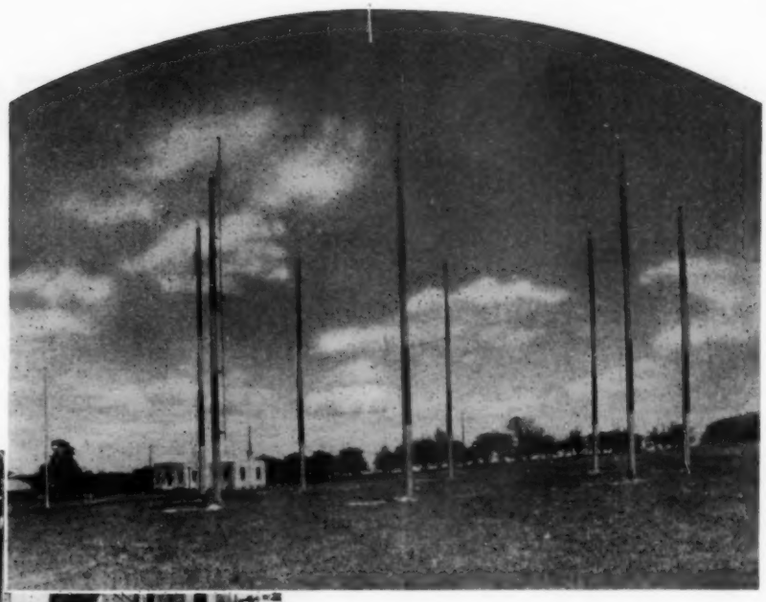
1906—Electrified the N. Y., N. H. and Hartford Railroad, using 11,000 volts single-phase a.c. current.

1920 — Developed diesel - electric drives for ships . . . Originated radio broadcasting with station KDKA.

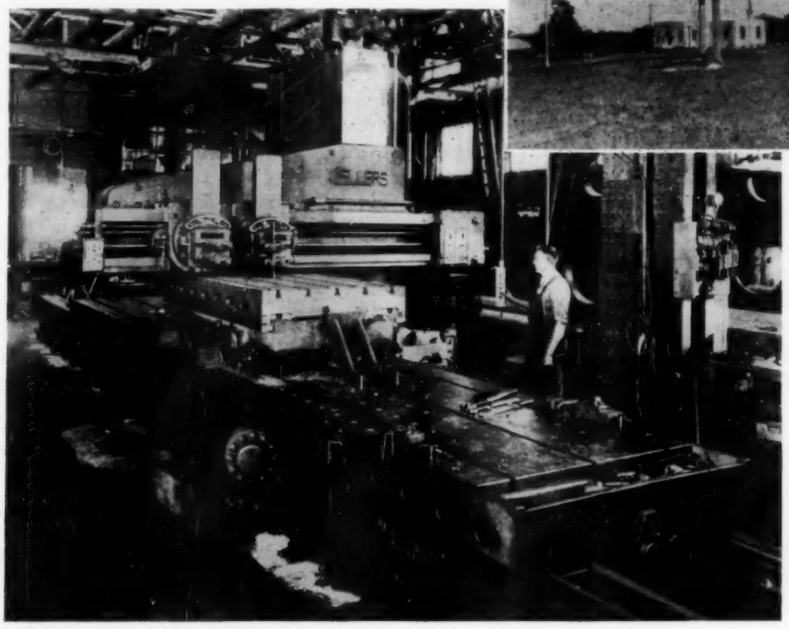
1921—Electrified the superdreadnaught *Tennessee* with Westinghouse turbines, propeller motors and auxiliaries.

1926—Inaugurated the electric

Three radio broadcasting stations are operated by Westinghouse; to the right is shown the short wave antenna of Station KDKA



Machine tool operation is made convenient and speedy by electric drive and control as exemplified by the Sellers planer shown below



welding of buildings . . . Developed the Grid-Glow tube, the so-called electric eye.

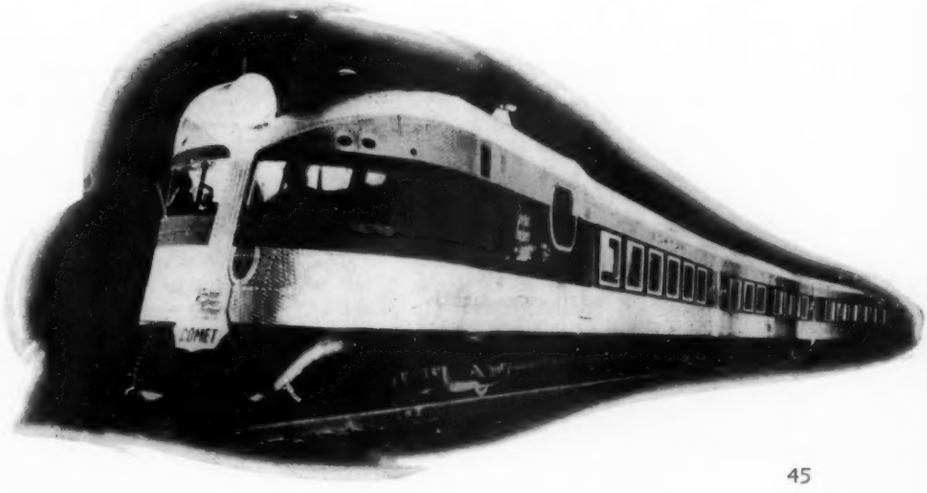
1929—Built the first diesel-electric rail car in the U. S.

1933—Built the highest speed passenger elevators in the world for Radio City, Rockefeller Center, New York.

1934—Built locomotives and other electrical equipment for the Pennsylvania Railroad electrification, New York to Washington . . . Opened the first completely electrified home, Mansfield, Ohio . . . Built the giant water gates for Boulder Dam.

1935—Installed 183,333-kva. turbine generator unit, the largest in the world . . . Built two of the largest waterwheel generators in the world rated at 82,500 kva. for Boulder Dam . . . Equipped the N. Y., N. H. & Hartford Railroad streamlined *Comet* with Westinghouse diesel engines and electrical equipment throughout.

In 1935 the same railroad put into operation the streamlined "Comet" carrying Westinghouse diesel engines and electrical equipment



gineers dreamed of a home so built and equipped as to make all possible use of electric facilities. From that vision came the "Home of Tomorrow," at Mansfield, Ohio, which defined a new way of living. Exemplified in this Home are ideas of automatic convenience, improved illumination for beauty and utility, measures to safeguard health, and functional kitchens and laundries.

As Westinghouse stands at the threshold of its next half century, its researches are continuing, its products are being improved. In every advance toward higher standards of living in the past 50 years, electricity has played a prominent rôle. There is every reason to believe that the electrical industry, of which Westinghouse is so important a part, will continue to be an integral part of every advance made in the next half century.

CHANGEABLE CORES for a

Provision for interchangeable pads permits making drill stands for fractional, metric and wire gage sizes with one set of tools

E. STEVAN
Wolverhampton, England

DRILL stands of a type similar to the one illustrated in Fig. 1 are made primarily as advertising media for makers of twist drills for prominently displaying their wares to prospective purchasers, or are given for the same reason to large users of twist drills.

The most economical method of producing the drill stands is by die-casting, for beyond a trivial trimming operation and a protective electroplated or japan coating, no further work is necessary. When cast from a zinc-base alloy, the cost in both production time and material is low. By giving consideration to the quantities and sizes of drills to be held, it is possible to arrange the dies to accommodate a variety of interchangeable pads, so that drills of fractional, metric, or wire-gage sizes may be held, while panels bearing different maker's names may be incorporated.

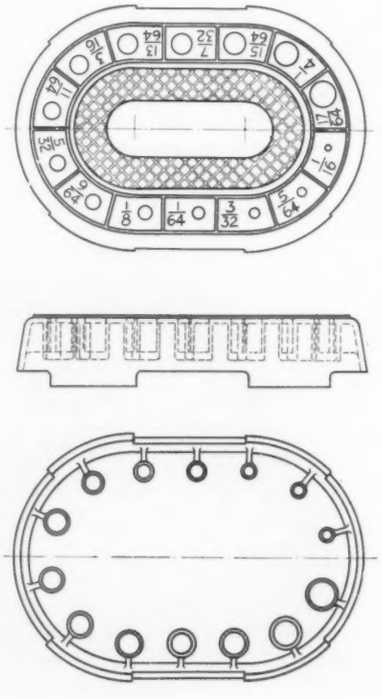
The dies illustrated in Fig. 2 are designed to produce two drill stands at each cast. The whole of the matrices are cut in the cover plate and the holes for the drills are made by the cores *A*, which are machined slightly larger in diameter than the required holes. The cores are held by means of turned heads in pads *B*, which are inserted in previously milled recesses, and upon which are cut the panels *C* to contain the maker's name and any decorative engraving. All holding screws have been omitted from the drawing for the sake of clearness.

The impressions of the work are cut in the cover plate because of the better surface finish that can be so obtained and the necessity of eliminating from the face of the work any marks likely to be made by the ejector pins. Those who are experienced in the production of die-castings may object to this proceeding because the cooling metal will grip the small cores tightly, causing the castings to break from the sprue and remain in the cover die. This was obviated by giving the maximum draft to the cores, oil-stoning them along the lines of draft to high finish, and by making a rather rough finish around the hole bosses *D* in the opposing die member, thus causing the castings to adhere to the ejector die from which they are stripped by ejector pins.

Pads *F* for allowing the correct wall thickness of the castings are retained in the ejector die plate in recesses milled to receive them. In these pads are machined recesses to form the bosses *D* and the thin stiffening webs *H*. The recesses around the base of the drill stand to form the four feet are allowed for on the pads, which fit snugly in the die matrices for the required distance.

The sprue bushing *I*, of hardened and ground high-speed steel, is tightly fitted to the cover die from the back, through the taper hole of which molten metal is admitted to the die. The sprue pin or spreader *K* projects from the ejector die into the opening in the sprue bushing, further compressing the molten metal and deflecting it by way of the gates to the die matrices. By allowing sufficient depth to accommodate the flange of the sprue bushing, the shallow recess *L* is formed in the back of the die and serves to locate centrally the cover die plate on the fixed platen of the casting machine by registering with a pilot.

Fig. 1—Drill stands of zinc alloy are cast two at a time and require little finishing. The holes for the drills can be made any required diameter by changing the cores



IN THE type of casting machine in which this die is used, the nozzle of the pressure chamber makes contact with the die and is sealed against a spherical seat machined on the rear of the sprue bushing. It will be seen that, being in constant contact, this portion of the die will become hot. Unless some means of cooling is employed the metal around the sprue and near the feeding gate *M* will not solidify quickly enough for speedy working.

Two 3/8-in. holes are drilled through the width of the die plate at *N*, between the edge of the sprue bushing and the impressions. A piece of copper tubing *O* is bent over and inserted, the protruding ends being flared and retained in position by screwing pieces of larger tubing into them, to which are afterward attached flexible tubes, one from the water supply and the other to the cooling coils.

Both the cover and ejector dies are aligned on the machine by hardened dowels *P* engaging bushed holes at each corner, while the ejector die is attached to the moving platen by the flanges of the base upon which it is mounted. The die base is a heavy iron casting and houses the cylindrical

DIE-CASTING DIE

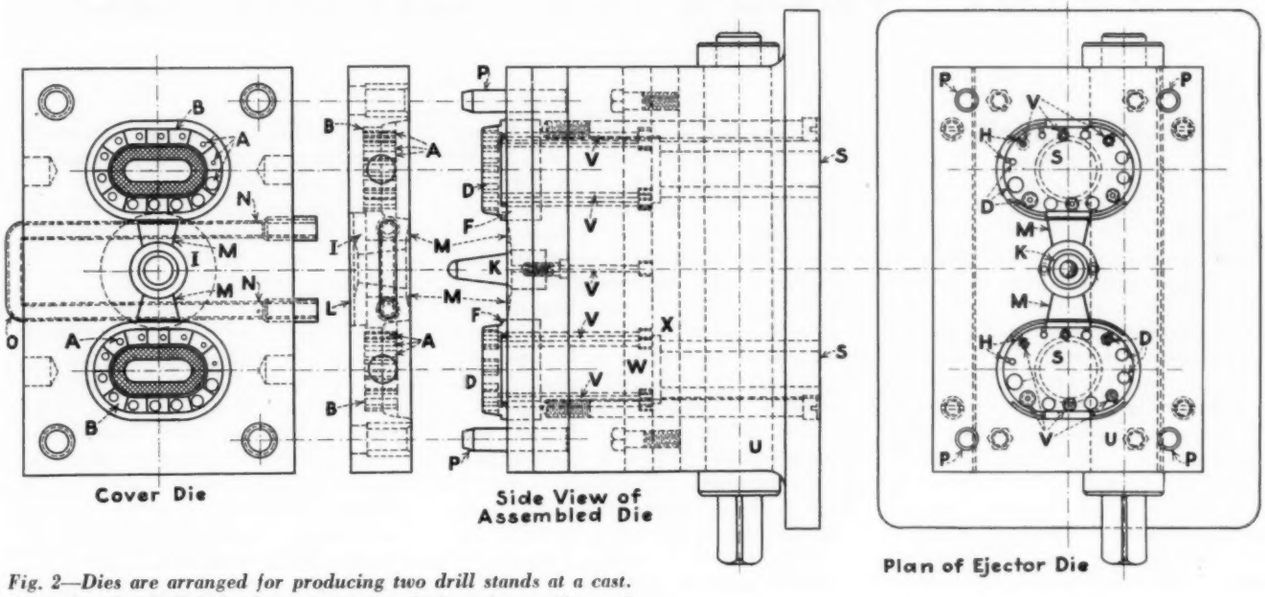


Fig. 2—Dies are arranged for producing two drill stands at a cast. Cores for the drill holes have maximum draft and are oil-stoned to a high finish to prevent the castings from sticking in the cover plate. Water circulating through copper pipes keeps the dies cool

racks *S* and the long pinion *T* by which motion is transmitted to the ejector mechanism.

Holes are drilled for ejector pins *V* through the die plates from the recesses forming the bosses and are spaced to give a well-balanced support to the castings. The ejector pins are carried in the ejector plate *W* beneath the die and are retained therein by formed heads and grub screws. The ejector plate is attached to the ejector carrying plate *X* which, in turn, is attached to the heads of the two racks *S*. An ejector pin is also placed on each side of the sprue pin, so that the whole gate of castings can be lifted out together. By connecting the pinion lever to a fixed point on the machine frame, the ejection could be rendered automatic, operating as the die carriage moves back to the open position.

The whole die is a self-contained unit, simple yet efficient in operation. With reasonable care in working and with ample lubrication it gives a constant, trouble-free and speedy production of high-quality castings.

Training Must Be Specialized

A. W. FORBES
Forbes & Myers

"One labor authority says that 90 per cent of those who think they are learning a trade are, in fact, learning only a small fraction of a trade."

This is quoted from the *Machinist* (Vol. 79, page 749), the very first sentence in the article. If it had been intended to apply only to the machinist trade, the figure should have been 100 instead of 90 per cent. The machinist trade has grown to such an extent that no person can possibly learn it all. The idea of trying to teach the whole trade in four years is absurd.

The profession of medicine had the same problem some years ago. I have a copy of an old indenture, in which an apprentice expected to learn all of "physick & Surgerey" in two years. (I do not know why physick is spelled with a small letter and Surgerey with a capital, but it is done consistently in this indenture.) Today no one would think of teaching the whole field of medicine to one person. Each is given a minimum of facts which it is considered essential for every doctor, and the rest of the practice is divided among a large number of specialists.

The machinist trade has met the same difficulty, and it should be solved in the same way. There are a minimum of standard practices that every machinist should be expected to know, and on that minimum each should be expected to build in some specialty.

The Norton Company, of Worcester, has recently adopted that principle. In eighteen months it proposes to give a minimum of general knowledge of the machinist trade and enough practice to produce specialists in the operation of some machine. It is evident that the general training of these eighteen months must be quite limited. Is it sufficient? I do not know. But I should be inclined to think that eighteen months was too limited a period.

Whether the program is broad enough or not, the point I want to stress is that the Norton Company is on the right track. We must give up the idea of doing the impossible, of teaching an entire trade, and frankly plan what part we will teach. What are the essential elements that should be common to all, and how should the various subdivisions be classified?

RIGHT GEARS for WRIGHT ENGINES

H. R. LE GRAND
Assistant Editor

ONE of the most interesting gear drives in the Cyclone radial engine is the reduction drive to the propellor. The gear ratio is 16 to 11. Most Cyclones deliver around 800 hp., which presents a very nice problem in designing and building a drive that will deliver at least 2,000 hr. of satisfactory service, be as light as possible and yet have an ample factor of safety. The reduction drive, illustrated in the first part, is of the planetary type. It incorporates an internal driving gear, an external spur gear which is stationary, and six pinions of unusual design. Permissible over-all backlash allowed is 0.002 in. because each of the six pinions must take its share of the load. There are eight contacts in this train, which makes it imperative that accuracy be maintained every step of the way.

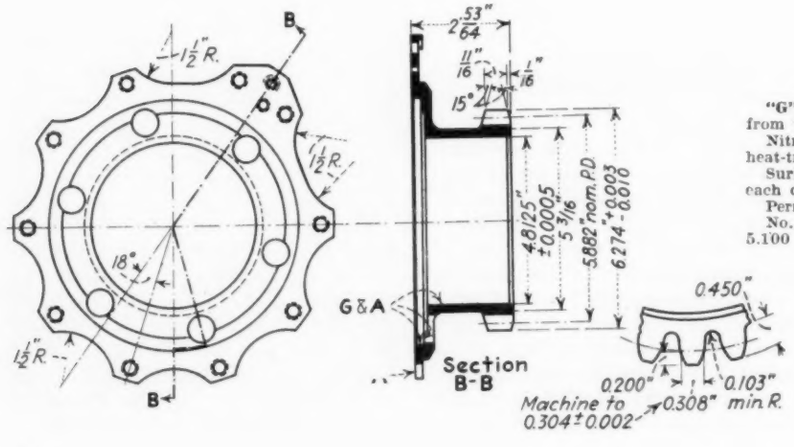
The six pinion gears are assembled on a spider integral with the propeller drive shaft, and they are mounted on special bronze bushings. When these bushings are finish bored on a special diamond boring machine they are located from the 1.4950 in. diameter on the pinion, Fig. 2. The teeth are cut to an 18-deg. pressure angle with a full radius at the root. With the Fellows or B.&S. standard depth the fillet radius is very often small, and the company has found that tooth failure usually occurs at that point. Therefore, the depth has been increased slightly and practically a full radius has been added to the cutters to develop the approximate radius specified in Fig. 2. The purpose of roughing to a different pressure angle than required for the finished tooth is to allow very little stock at the base of the tooth for grinding. The ground surface blends into the root radius without steps.

The pinion is made of SAE 3312 steel. After cutting it is carburized and hardened. Quenching is carried out in the die shown in Fig. 3. As indicated by heavy dash lines the hot pinion is placed in the base *A*, the plunger carrying expander *D* being in the up position. Surrounding the base are the external spreaders *B* which apply pressure on the ends of the teeth around the entire gear. As shown in the detail, these spreaders are made in segments, in this case six to the circle. The expander *D* carries six internal spreaders *F* which apply pressure around the inside of the gear rim.

When the quenching die is closed, the bottom half rises through a short travel and contacts the bracket *G* which forces the external spreaders inward. Meanwhile the upper plunger descends, causing the expander to push the internal spreaders outward into contact with the inner side of the gear rim. Thus, in the initial stage of cooling the gear rim is under even and equal pressure on both the exterior and the interior. But when the temperature falls to 1,250 F. the stop ring *C* prevents further action by the external spreaders, and pressure is applied solely to the interior of the gear rim until the pinion is cool.

When the gear reaches a temperature of 1,250 F., it is no longer so plastic and does not require external support. Moreover, the stresses set up in cooling should be free to adjust themselves without too much interference. As the gear cools it is continually working against the pressure applied by the internal spreaders. Concerning these, there is one significant kink that has been learned by experience; that is, the spreaders are designed to the cold size, not the hot size, of the diameter supported. Formerly the hot size was the basis for calculation, but it was found that the internal spreaders would cause thin rims to belly by as much as 0.020 in. at the high spots.

AFTER hardening, the pinion is chucked over pins in the tooth spaces and the 1.4950-in. diameter is ground on a Heald Size-Matic. This machine is equipped with a special quill carrying a formed ring-type wheel because it is necessary to reach under the gear rim. The shank is ground to ±0.0005 in. and the bottom and outer radii trued up. The teeth are next ground on a Pratt & Whitney two-wheel hydraulic gear grinder, holding a very accurate reading over pins to insure uniform tooth thickness. The gear is lapped on a Fellows machine with an internal-type lap and checked



"G" surfaces to be ground: remove 0.000 to 0.006 in. from "G" surfaces after nitriding. Finish all over.
Nitride all over to 0.020 to 0.030 in. deep, except threads; heat-treat core to Brinell test 290 min. 321 max.
Surfaces marked "A" and P.D. of gear must run true with each other within 0.003 in. full indicator reading.
Permissible backlash 0.002 to 0.006 in.
No. of teeth of mating gear 18; 20° 20' pressure angle; 5.100 diametral pitch, 30 teeth.

Fig. 4—Because the stationary reduction drive gear can not be ground after hardening it is made of nitriding steel. Teeth are lapped twice to secure desired backlash and polish

Details of specific parts complete the account of how this aircraft manufacturer has succeeded in controlling distortion (AM—Vol. 80, page 4)

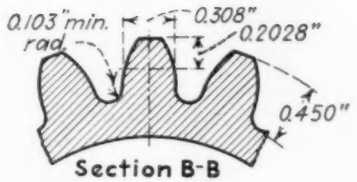
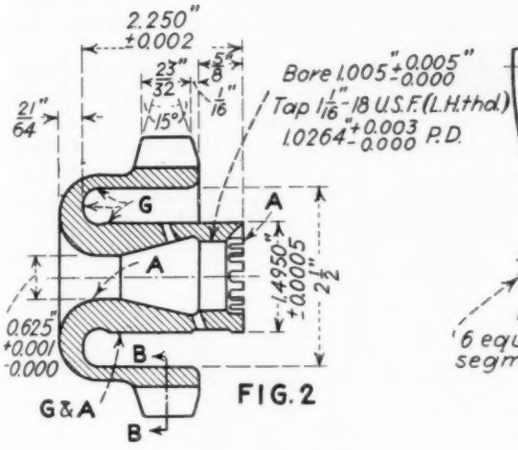
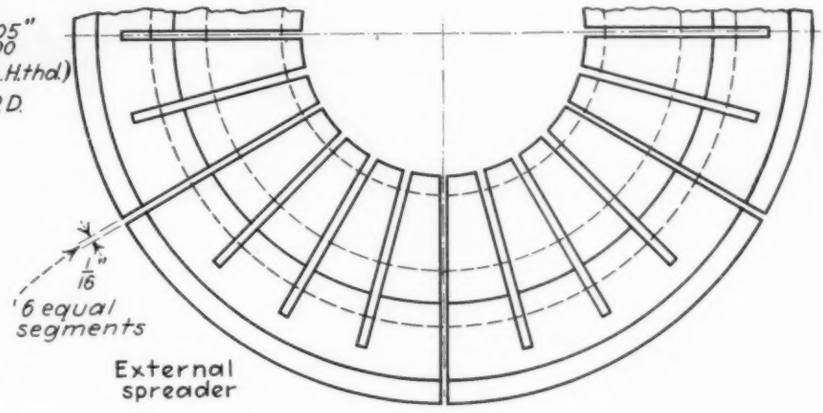


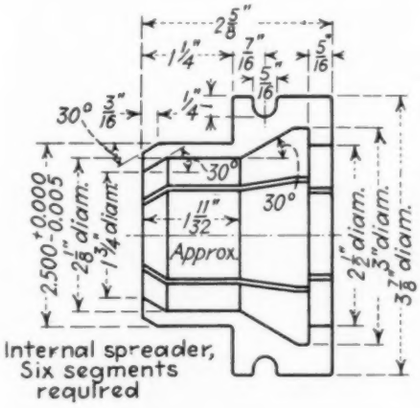
Fig. 2—The fussiest job among the engine gears is the reduction drive pinion. Permissible backlash is less than for any of the others. Fig. 3—By means of this quenching die the pinion is prevented from distorting during hardening

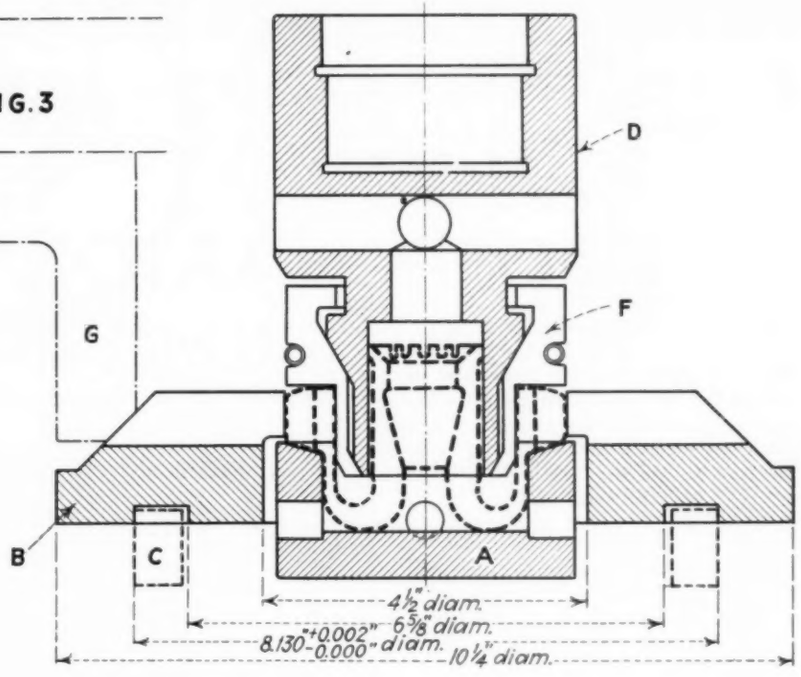




Finish all over.
G surfaces to be ground.
C surfaces to be case-hardened.
Surfaces marked "A," P.D. of thread and gear must run true with each other within 0.002 in. full indicator reading.
Permissible backlash 0.001—0.003 in.
20 deg. pressure angle.
18 teeth, 5.1 D.P.

FIG. 3





for backlash. Relapping follows for the few minutes on a Michigan machine to give a high polish to the tooth surfaces. Before going to final inspection the remaining surfaces are tampico brushed, giving them a mirror surface for Magnafluxing. Cracks at any section are then detected instantly.

Both the internal and the external gears in the reduction drive are made of the nitriding steel. The teeth in these gears are cut with extreme care and accuracy. Care must be exercised in packing the furnace to prevent warpage, because neither gear can be ground after hardening. Where it is necessary to machine after hardening ample material is allowed. This material is ground off, leaving a surface which is about 390 Brinell. Teeth are lapped in a Fellows No. 10 LS machine.

The remaining gears found on the engine proper are used to drive such units as the oil and fuel pumps, tachometer, generator, magneto, cam, supercharger and various other accessories. Although none of these gears carries such a critical load as the reduction drive, still some of them run at high speed, especially the supercharger. Their thin webs and light rims present difficulties in preventing distortion in cutting and hardening. Quite a few of them are of the cluster type in which the teeth of the small gear can not be ground after hardening. Therefore, warpage must be confined so far as possible to surfaces where correction can take place.

A good example of a cluster gear is the supercharger intermediate gear Fig. 5. The small gear is cut and

checked with ground master gears for roll and backlash, and the teeth of the large gear are cut with grinding stock allowance. After the heat-treat the small pinion is rough lapped to remove any irregularities. A series of pins are inserted in the teeth and the whole inserted in ground chuck jaws for the operation of grinding the bore. These pins are indicated to insure that concentricity of the pitch line and the bore is within 0.001 in. The bore is held to a tolerance of ±0.0005 in. and then used for locating on the arbor of a Pratt & Whitney two-wheel gear grinder where the teeth of the large gear are ground within a few tenths of correctness. After grinding, the teeth of both gears are finish lapped. The small gear is lapped to correct bearing and backlash, but the large gear is lapped only to remove grinding marks.

From Fig. 6 it is evident that the quenching die is of different construction than the die for the reduction drive pinion. The gear is nested directly in the external spreaders *A* and with the stub side down. Internal spreaders are at the bottom and are actuated by a plunger *B*. The plunger also has hold-downs *C* and *D* for the upper side of the large gear rim and the short end of the stub journal. Thus, clamping is effected on the ends of the teeth of the small gear by the external spreaders which also offer a surface *F* for holding the rim of the large gear straight. The internal spreaders hold the bore in line with the rim of the large gear. Surface *G* on the internal spreaders and surface *H* on the inner spring hold-down prevent lateral movement of the journal with relation to the web of the large gear. Spacing pieces *J* now used on the top and bottom of the web prevent buckling.

This die is but another proof that distortion is the bugaboo manufacture of aircraft-engine gears. It is an example of the ingenuity and care brought into play by Wright in furnishing long-wearing engines for the skyways of the world.

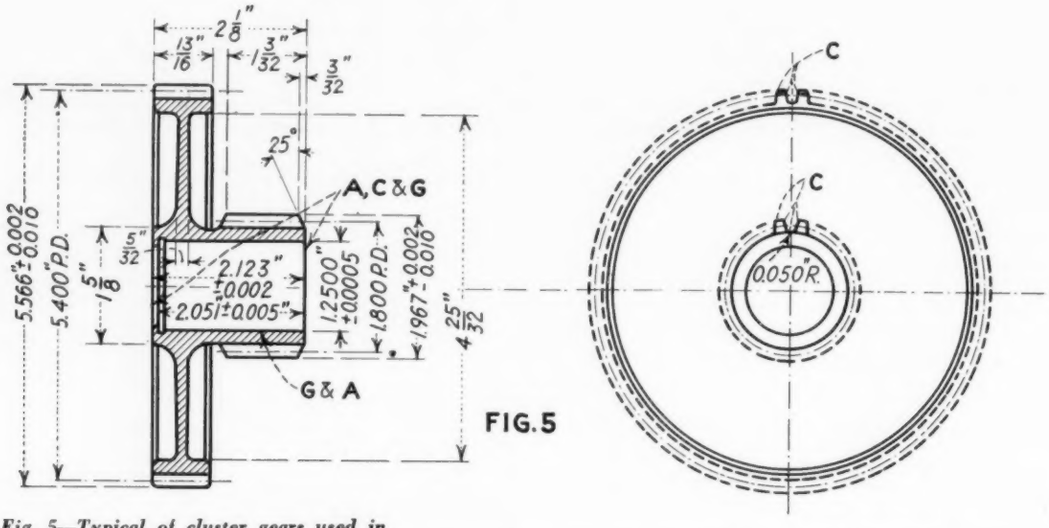


FIG.5

Fig. 5—Typical of cluster gears used in aircraft engines, this supercharger intermediate gear is rough lapped on the small gear which is then chucked on pins for grinding the large gear. Both gears are then finish lapped

Surfaces marked "A" and P.D. of gears must run true with each other within 0.002 in. full indicator reading.

"C" surfaces to be case hardened—Rockwell "C" on core 32 to 40; Rockwell "C" on case 60 minimum. Depth of finished case 0.025 to 0.035 in.

"G" surfaces to be ground.

Small Gear

Permissible backlash 0.004 to 0.008 in.
0.1933 in.—Whole depth B.
0.0868 in.—Corrected addendum.
0.1569 in.—Chordal thickness (St'd).—Machine to
0.1509 ± 0.002.
0.3142 in.—Circular pitch.
18 teeth $\frac{10}{12}$ pitch.

Large Gear

Permissible back lash 0.003 to 0.006 in.
0.1933 in.—Whole depth.
0.0844 in.—Corrected Addendum.
0.1570 in.—Chordal thickness (St'd)—Machine to
0.1525 ± 0.0015.
0.3142 in.—Circular pitch.
54 teeth $\frac{10}{12}$ pitch.

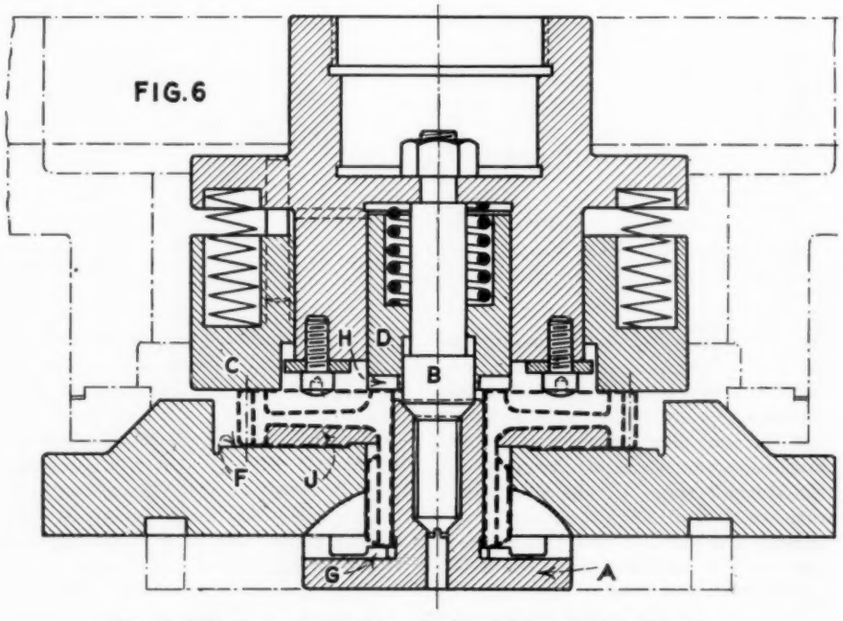


FIG.6

Fig. 6—This type of quenching die is used for all of the cluster gears. There is no direction in which the gear can distort

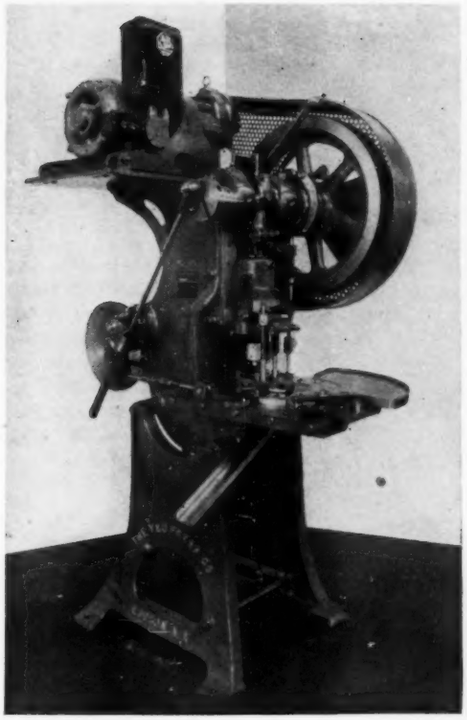


Fig. 1—A fiber insulator is scored, cut from the strip and pressed into a metal crosstie fed into position by the dial

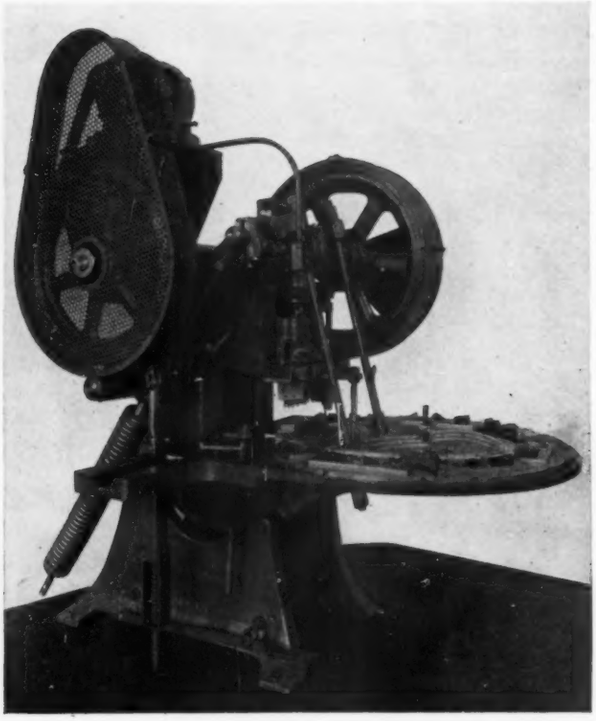


Fig. 2—Three operators place toy track parts in the dies, and the press crimps the crossties to the rails

SPECIAL TOOLS ASSEMBLE TOYS

Products for the playroom yield to mass methods that save rehandling parts and space for their storage

SOME interesting examples of special tooling in press work are presented by a few of the set-ups used in the fabrication of toy locomotives and tracks. Presses and tooling arrangements illustrated were designed by the V & O Press Company, for a well known toy manufacturer.

The No. 01 plain press, Fig. 1, equipped with an automatic ring type dial feed, automatically feeds, scores, cuts and assembles fiber strips into the crosstie, forming the insulation for the third-rail on toy electrical track sections.

An operator places a crosstie in a slot in the feed dial; the dial conveys it under the die, where the strip of fiber, fed through a roll feed from a reel in the rear of the machine, is formed and pressed into the tie. Advancement of the dial then carries the piece to another station where it is ejected and slides down a chute into a work box.

Speed of this machine depends primarily upon the skill of the operator placing the parts in the dial, and with an average operator has proved to be approximately 55 pieces per min. This machine not only performs this operation at a higher rate of speed than has been previously accomplished, but is safer from the operator's standpoint, because parts are fed into the dial away from the action of the slide.

Final assembly of the track sections is done on the company's No. 3¼ geared press, Fig. 2, which is equipped with a similar dial feed, having a dial plate approximately 48 in. in diameter with eight stations. Feed drive is by a crank from the shaft through a bell-crank connection which actuates the pawl-driving slide by means of a rack and gear. On the dial plate, doweled in position, are eight sets of dies. Three rails and three crossties are placed on the dies by three operators. One operator places the three crossties in position, the next operator places the two outside rails on the positioned ties, and the third operator locates the center or third-rail in the insulated grooves in the ties.

When the table indexes under the punches, tabs on the ties are crimped around the lower flange of the rails.

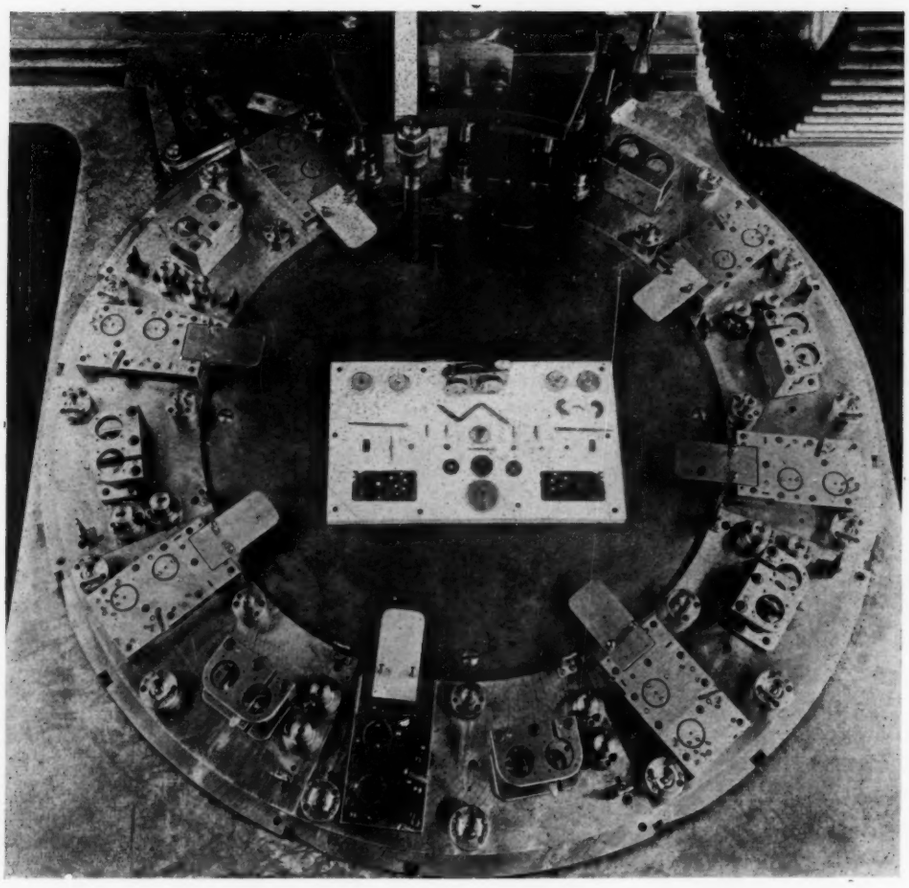


Fig. 3—Twenty-nine parts, either singly or in the form of sub-assemblies, are put together to form a toy electric motor. Five operators and five cycles through the press are required before the completed motor emerges

At the next station, two plungers raise the completed assembly off the dies, and a jet of air blows the section off onto a chute. These parts are produced at the rate of about twenty per minute.

THIS machine is fitted with an automatic positive safety stop which is actuated from the shaft by a cam. After the dial comes to rest and is locked in position, the safety stop mechanism drops a pin in a hole in the dial plate, allowing the machine to continue operation. If, for any reason, the dial plate does not come to its proper position, the pin, instead of dropping in the hole, rests on the top of the dial. This pin is actuated by a vertical shaft, and when it does not drop into its closed position, it causes a lever to engage with the switch ring, which disengages the clutch dog from the wheel and automatically shuts off the machine. This feature eliminates tool or die breakage.

A close-up view of the dies used for assembling toy locomotive motors is shown in Fig 3. These dies are mounted on eight segmented sections which in turn are mounted on a 4-ft. dial plate. The dial feed operates in the same manner as that described in connection with the track assembling machine.

The locomotive motor is made up of 29 separate parts, and five passes through the machine are required to complete the assembly. Several of the parts, such as the gears, shafts and pinions are sub-assembled before they are placed in the main assembly.

In the first cycle of the dial, the spacing bars and one side plate are placed in the dies. These parts are conveyed under the punches where they are riveted together. In the next cycle, this assembly is picked out of those dies and placed in a second set of dies. At that time, several other parts are added, which must be riveted in position. Two sub-assembled wheels and the other side plate are then positioned in the third set of dies and the third cycle takes place. In the fourth cycle, the driving wheels and driving rods are added. In the fifth cycle, the driving wheels and two other main wheels are placed in position, and the skeleton assembly is placed in the cradle which contains the driving and main wheels. These parts continue on under the punches where the wheels are pushed onto the main driving shafts. In the next position of the dial, the completed motor is ejected. Five operators are necessary to perform the positioning operations in order to maintain a production of approximately five motors per minute.

Saving Railway Costs

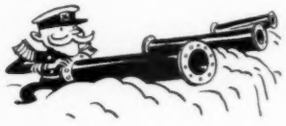
Makers of lift trucks, power shop trucks and trailers should get not crumbs of comfort, but whole loaves of satisfaction from the Report on Handling Railway Stores Material by the Federal Coordinator of Transportation. This report cites case after case where material handling apparatus of various kinds has made tremendous savings in handling costs. Percentages can easily be misleading but when a single electric crane truck saves one railroad over $1,000 a month, railway managements can begin to perk up and take notice. The cases cited include machine shop work as well as other departments. Lifting magnets and other handling devices also get their share of attention. It's a good report and should be carefully read by railway executives.

Talking Shop

No news is good news when business is the topic. Most of us will complain aloud when orders are on the way down. But when they start up again we keep quiet about it lest our competitor get wind of it and try to take them away from us.

Centrifugal Castings

Starting with the lowly sewer pipe, centrifugal casting seems to be making its way into various lines of work. This type of material now includes field guns for the Army and Navy and pump liners that vary from ⅛ to ⅜ in. in thickness when bored and turned. These thin liners are of Monel



metal while the guns are a special alloy of steel. Some feel that locomotive driving axles, and propeller shafts for steamships are among the possibilities of this new development.

Most people say little about their charities. Many big manufacturing companies have been as reticent, but their benefactions to their men have brought some of them to the verge of receivership. Too bad these facts cannot be put forward when bureaucratic trouble hunters start their attacks.

Etching Stainless Steel

Showing grain structure by etching metals with acid is common practice and convenient. But when it comes to metals that resist corrosion, such as stainless steel, etching is quite a problem. So the Bureau of Standards has developed a method that will be welcomed by metallurgists and others.

This method consists in etching electrolytically in oxalic acid (10 grams dissolved in 100 milliliters of water), the specimen being the anode and a piece of platinum the cathode. Current is supplied from four dry cells in series or from a 6-volt storage battery. Carbides are revealed in from 15-30 seconds etching time, and an additional 30-45 seconds will also reveal the grain boundaries in the 18-8 (18 per cent Cr, 8 per cent Ni) type. The solution is relatively rapid in etching action and does not stain the specimen.

How Heavy Is "Light"

Such adjectives as "light" mean little unless we define them specifically. A proposed new locomotive for "light," high speed passenger trains weighs 300,000 lb. and the tender 213,000 lb. more, a total of over 260 tons for the motive power alone. No figures are given as to the weight of the proposed train or how many passengers it can

carry. It is interesting to note, however, that the Burlington Zephyr carries 72 passengers and 50,000 lb. of baggage and express in a train whose total weight is only 195,000 lb., or 9 tons less than the loaded tender of the proposed locomotive without the locomotive itself.

It looks as though railroad designers would have to tackle the problem from a new angle that will approach the dead weight per passenger of the new trains. They need a new conception of what "light" really means.

Mr. Cameron, of the Ford Motor Company, did a lot to spike the guns of the "or-elsers" when he pointed out that industry never employed as many as 9,000,000 workers, and that it could hardly be held responsible for the finding of jobs for 11,000,000 idle. Particularly as more than 7,000,000 of the 9,000,000 have been re-employed.

A New R—Radiology

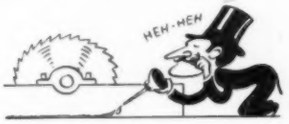
There's a new "R" to add to the three that were formerly supposed to be enough "larnin" for anybody. It's radiology for industrial uses.

And there's a new unit known as the St. John X-Ray Service installed at the new Brooklyn Technical High School. Boys are to be taught the use of X-ray and fluoroscope in inspecting materials of various kinds. Sand molds can be inspected before the casting is poured, as well as the casting itself after it comes from the sand. With at least 50 X-ray machines in daily use in factories of various kinds the field for experts in this work seems bound to increase, and this school believes in taking time by the forelock.

Trouble in finding properly trained men is not confined to the machine shop. Those who are trying to organize the administration of our new alphabetical bureaucracies are having an even worse time finding the men to head the central and local divisions. No one has ever been trained for this kind of work. Small wonder if the agencies fail, from this fault alone.

Slippery Floors

Slippery floors are a hazard whether in the shop or home. This is particularly true when they are near high-speed saws or similar machines. If it



seems impossible to keep wooden floors in a non-skid condition it's a good hunch to put good sized pieces of safety tread material around the dangerous machines. This will pay for itself in reduced accidents in almost any shop. —*The Editors.*

MATCHED CUTS in MILLING

Accurate location from the same reference surfaces is the secret of fixtures designed for this purpose

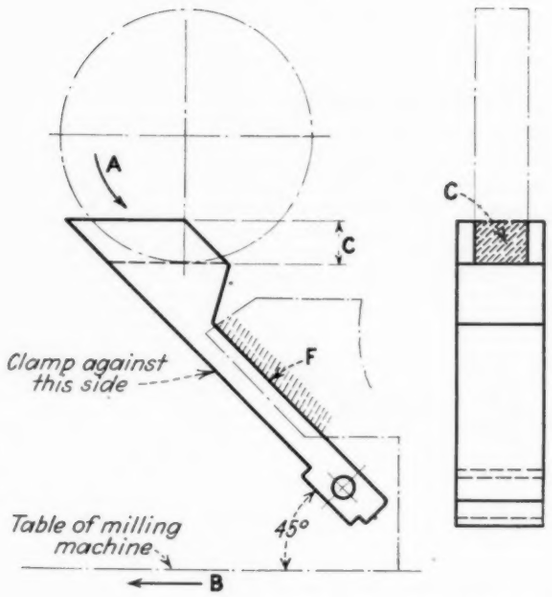


Fig. 1—A slot is milled in the big end at an angle to the axis of the part; location is taken from the top surface F and the sides

F. SERVER

TO THE machine operator who must match a second cut with one previously made, the fixtures illustrated will appeal as possessing requisite construction features that are oftentimes overlooked.

The work was milled first in the setup shown in Fig. 1. With the work held 45 deg. to the table a cut is taken with the cutter revolving in direction *A*, while feeding the work in the direction *B*. The locating portion of the fixture is indicated by *F*, against which the work is clamped and located sideways.

Further explanation of the position of the cuts to be matched is given in the upper right-hand corner of Fig. 2. The end cut, made in Fig. 1, is designated as "previous cut," whereas the words "present match milling cut" indicate the operation performed in the fixture shown in Fig 2. Here a triangular block of metal is removed, and match milling requires that the cutter must track exactly along lines Z and Z'. The accurate means of location provided assure that match milling will result, avoiding a stepped surface where the cuts join.

The work is located in Fig 2 from the sides by blocks *F* and *H* and at *I* (both sides) exactly as in the previous operation, thereby locating the work sideways and from the top. Because the upper surface *K* of the work must also be made to match the milled cut, this surface is forced up against the surfaces *L* of blocks *F* and *H*. The work is otherwise located lengthwise by being mounted on a snugly fitting spring pin *M* which is pulled back by the knurled knob *N* while putting the work in position.

Clamping the work against surfaces *L* is accomplished by employing a semicircular wedge plate *Q* shown in the end view, Fig. 2. This plate pivots about stud *P* as a center and it has a long pin *S* by which the operator swings the wedging segment towards the front of the fixture when removing the work. The wedge plate when in the position shown engages the under side of the work at *T* and, as the contacting surface of the segment has its radius off center it will wedge the work securely against surfaces *L*. Note that the radius of the wedge is greater at the left end of the segment than at the right end, as seen in the end view.

The clamping wedge is pulled into the position shown by the spring *V* and it is locked in that position by the hooked bolt *X*. Tightening the hooked bolt is accomplished by means of handle *H'* which passes through a hole in nut *K'*. The hooked bolt is retained by the pin *M'* so that it will not revolve when tightened but spring *N'* causes it to release the segment when the handle *H'* loosens the nut.

To remove the work from the fixture the operator takes hold of pin *S*, pulls the segment *Q* towards the front of the fixture until it assumes the position shown by the dot and dash line. When spring *V* assumes the position indicated by the center line *Y*, it holds the segment down against the pad *P'*. With the segment in the released position the work *A* can be slid into the fixture from the left end through slot *S'*. By holding the pin *M* back with the knob *N*, the hole in the work is then placed over the spring pin and said pin is allowed to snap into place. The operator then holds the left end of the work against the surface *L*, takes hold

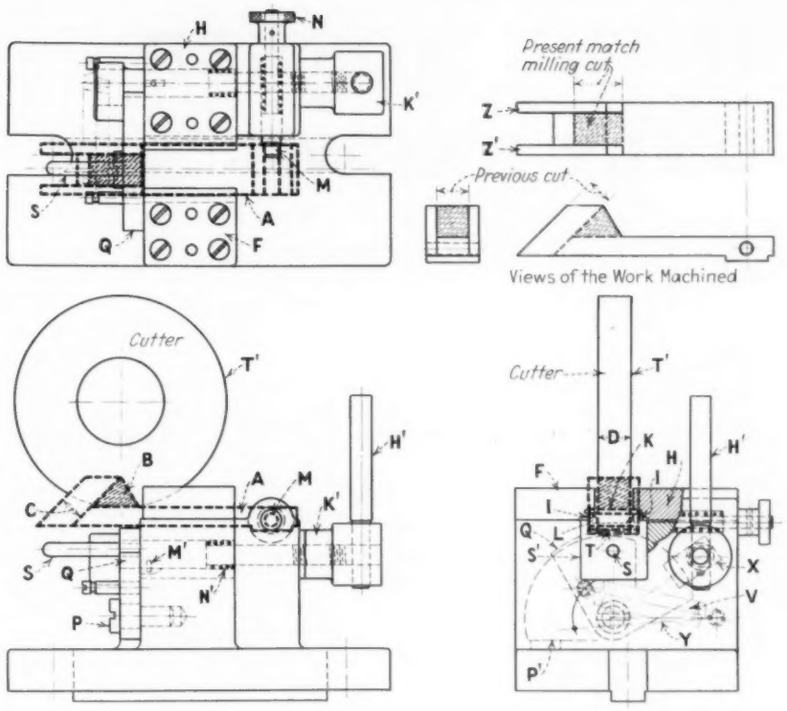


Fig. 2—When the second slot, this time parallel to the part axis, is matched with the first, the fixture must again locate the work from top and sides

of pin *S* and moves the wedging segment into the clamping position, where the spring *V* tightly holds it against the work at *T*.

The cutter *T'* then mills the work with the assurance that as the work is accurately located along the machining line at *K*, and as it is also located sideways in the same manner as previously located while milling the end cut, matching of the two cuts will be as accurately accomplished as practical.

Operation Sequence Traced by Plating

J. A. POTTER

"BEFORE we adjourn I have a special request to make," said the superintendent. "My college is outlining a course in manufacturing and has requested that I furnish something that will be of interest in that line. Whatever we agree upon must above all be practical and yet of unusual interest, in fact a novelty."

"Why not send them an example of spring milling or better still bridge milling?" said the chief draftsman.

"We couldn't spare a fixture and cutter as this is to be a permanent exhibit, and a blueprint probably would not convey the idea unless the students had seen such a tool in action."

"How about a blueprint showing successive stages of boring and milling on several different parts? Charts as they are called in the shop?"

"The idea is good but I had in mind something that could be taken in the hand to look at or be mounted on a board."

"I can give you just what you want," said a department manager.

"You do have some odd operations for making those small parts on your job. Let us hear what you have."

"That pintle hook on the new style machine is so small that it can be hidden under your thumb yet 47 operations seem to be the least that I can make it in. It is made in large quantities so I had a boy pick out one part before each operation and copper plate it. The copper-plated hook was then the first to be run through for the next operation. It was then placed on my desk for approval before completing the operation on the others. This resulted in a complete set of copper plated parts from the screw machine up to the finished part, with each successive stage showing bright where the operation is performed. It will be a simple matter to stamp or etch each operation number and mount on a board for your exhibit."

"Sounds good! Draw out of stock a finished part that has been hardened and polished to make the exhibit complete. What made you start this procedure; isn't it rather expensive?"

"The expense was only a boy's time, probably not exceeding three hours. The first lot was smaller than the last, but trouble developed on screw-machine operations; in broaching the thin wall seemed to pull out of shape; cracks developed at hardening, all more or less traceable to variations in steel. This routine not only gave an opportunity to cover possible difficulties immediately but furnished a method of keeping in close touch with a difficult part."

Do you know of other methods for showing operations in sequence without resorting to charts?

Hard Iron for Trucks

Truck and bus cylinder liners, hardened to 450-500 Brinell, previously considered impractical because of machining difficulties, are now in regular production and deliver up to 200,000 miles before reconditioning as against about 75,000 for the old type 250 Brinell unalloyed iron. These cylinder irons, commonly containing 2 to 3 per cent nickel with added cromium or molybdenum, are pointing the way which passenger car engine materials must follow to possess more of the endurance now built into their big brothers, the trucks and buses. The trend is toward similar improvement in piston rings, exhaust manifolds and brake drums, all requiring alloy cast iron.

IF THE WORKER ONLY KNEW—

Would he want the 30-hour week?

CHINNING lazily with big Bill alongside the 72-in. planer in the after-lunch smoke, Sam set off the fireworks without intending to do so.

"What you going to do with that extra ten hours, Bill?"

"What ten hours?"

"The ones you get when we work only 30 hours instead of 40. There's a bill going through Congress, you know."

"No, I don't know, Sam—and I hope not."

"You mean you don't want shorter hours? You must be a glutton for punishment. Thought you'd like the extra time for reading—although I don't see what good all those highbrow books do you."

"No, I figure that I like to loaf as well as anybody. And I surely like to study, as you say. But I'm not making any more jack than I need. If I worked only 30 hours——"

"Wait a minute, Bill. You don't understand. You'd get the same as you're getting now. The bill says so. And a lot of other people would get jobs to do the work we're doing now in that extra ten hours."

"Oh, yeah? Where's the money coming from?"

"That's easy. The company's got plenty of money. And if they won't foot the bill instead of taking so much for themselves, let 'em raise prices. They can get it back."

"That's an idea, Sam, but it isn't altogether clear to me. In the first place, the company probably doesn't have the money. Just consider that only about sixten per cent of all corporations made any profit in 1932. Things are better now, but there are back bills to be paid. In the second place, if we raised prices everybody else would have to do the same thing, and first thing you know we'd all be eating tripe instead of steak. How would you feel if the old pay check didn't reach?"

"But I'd be willing to pay something extra for the extra time, Bill. I don't want it all."

"No, you're not hoggish, I admit that. But look here. You know as well as I do that when prices get so high you quit buying. You don't pay over $20 for a suit. And when cigarettes went to 17c. you began to roll your own. And you quit beer because you thought you ought to get it for a nickel. And your wife joined that meat strike three weeks ago because prices went up."

"But, Bill, those prices were too high. There isn't much labor in any of them. Somebody was just sticking it on."

"Not much labor, you say? What is anything, except labor? Everything we use in this would comes out of the ground. The only thing that makes it usable is the labor added. Isn't that so? Take these castings you and I plane all day. They were all ore once upon a time. Labor mined it, shipped it, changed it into pigs, melted them, poured the castings. Labor made the machinery for mining, the cars and locomotives for shipping, the furnaces for smelting, the cupolas for pouring—everything that went into the making of these castings. Now, just add one-third to the labor cost all along the line and see where you get."

"BUT HOW about the bosses, Bill? It wouldn't hurt my feelings if they took less and gave us more."

"No, that wouldn't worry me any either, Sam. But I don't think it would make much difference. I happened to see a table recently, in some report or other, that surprised me. It showed that in plants like ours—the manufacturing industries—labor got 83 per cent of all the money paid out for wages, salaries, and other forms of income. Suppose you took all of the remaining 17 per cent and split it up among the workers. Each one would get mighty little."

"You seem to have an answer for everything, Bill. 'Bout time for the whistle, I guess, but answer one more. If there is only so much work to be done, why not divide it up among all the people that can work and let it go at that?"

"I knew you't ask something like that. Reams have been written about it. But look at it this way, Sam. There isn't just so much work to be done. The amount of work this country does depends upon just how well it wants to live. You know that 50 million people might as well drive cars as 25 million. And several millions more would like to have radios, and moving picture machines. Well, they can all have them if we'll work to get them.

"But only certain people can de some kinds of work. How many men (or women) could run that big planer of yours? And what will happen if fellows like you, and our expert miller hands, and tool makers, and assemblers, are not permitted to work more than 30 hours a week? Or have to be paid so much that the company can't afford to hire them? We're not going to have the machines to make the autos and the radios to go 'round. And the fewer we make the higher they'll have to be sold and the fewer the customers. And that means plants shutting down. And what good's a 30-hour week then?

"I TELL YOU, Sam, it's a serious question. Looks good on the face of it, but ain't so good underneath. I hope that a lot of fellows like you don't set up a howl for it, because I think it's going to be bad for you if you get it."

"But is wasn't bad for workers, Bill, when hours were reduced from 60 to 54 and then to 48 and 40. Why not go further down or, if your argument is good, why wouldn't we all be better off if we went back to 60?"

"My idea on that, Sam, is that, as we develop machines to take over the work, hours naturally get shorter while we still make as many things as we did for people to use. But it's a slow process—takes time. Some day we'll not work any more than 30 hours—maybe not that much. But I'm all for letting the shorter hours come about naturally instead of all at once by law. See what I mean?"

"I think so, Bill. Thanks a lot. You've maybe changed my mind There goes the whistle. So long."

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Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 2
K. H. CONDIT • F. H. COLVIN
EDITORS

WHAT NAVY YARDS NEED

IN HIS budget for the fiscal year 1936-37 President Roosevelt includes an item of $567,800,000 for the Navy. By way of comparison the figure for this year is $425,350,000, and the one for last year was $321,400,000.

Most of this money will be spent for ships. Unfortunately, it is likely to be money well spent because the Naval Conference in London bids fair to accomplish little, and because the European arguments seem to be getting more acrimonious. Practically every citizen of the United States is willing to sacrifice almost anything to keep this country from being drawn into another war, but the interrelation of nations today is so complex that it may not be possible to stay out.

Thus it becomes necessary to provide for our own protection with an adequate navy. But with an increase in the number of ships in commission comes a greater demand for prompt service from the shore establishments.

Something over a year ago we published an article by Lieutenant-Commander Walker, officer-in-charge of machine tools and manufacturing section, pointing out how poorly equipped the navy yards are to meet the demands on them. We are now privileged to print a sequel to this article based on an inspection tour of the yards made by Commander Walker's party several months ago.

Both his own observations and those of R. E. W. Harrison, then chief of the Machinery Division of the Bureau of Foreign and Domestic Commerce, who was in the party, are decidedly to the point. Many of Mr. Harrison's comments, incidentally, apply with equal force to some of our commercial establishments.

IT IS to be hoped that Congress will recognize the importance of adequate facilities to maintain the expensive and intricate machine that is a modern warship, when it considers the appropriation for the Navy. If readers of *American Machinist* whose duties make them familiar with such matters would take it upon themselves to see that their Congressmen do understand the needs of the navy yards, they would be doing the country and themselves a service.

AAA Goes Out

ONCE more the Supreme Court has spoken and once more the New Deal is convicted of using extra-legal methods to accomplish its objects. Will history say that the Roosevelt administration was notorious for its efforts to center in itself dictatorial authority over a democratic people, or that it was noted for its courageous attempts to modernize an outworn theory of government no longer adapted to the needs of a country so large and complex as the United States of America?

Business and industry and some other fractions of the people hold the former view today. Certain other groups hold the latter one. Only history can tell which is right.

This latest decision which wipes out the AAA so completely cheers those who hope that the Social Security Act, the Wagner Industrial Disputes Act, the Guffey Coal Act, and the Public Utility Act with its death clause, are doomed. Each of these acts has been a burden to some section of American business, and as such is looked upon as undesirable. If they follow NRA and AAA out, the accomplishments of the New Deal will be slight indeed, unless we say that they were temporary emergency measures that served their purpose and were terminated.

Mr. Roosvelt announced that emergency measures would end when the emergency passed. He would be in a much stronger position now if he had held to that view.

Chips

WASHINGTON — Roosevelt reserves evening broadcasting time for his message to Congress and then tells members when to meet to hear it . . . Veteran groups unite on a bonus proposal . . . McCarl rules that Guffey Law is not applicable to contractors furnishing supplies or materials to the government (law specifies "public work or service") . . . Bonus and neutrality bills introduced at first session of Congress . . . Roosevelt asks for more than six billions, exclusive of relief, in budget for year beginning July 1, 1936 . . . Supreme Court invalidates AAA, 6 to 3 . . . Payments to farmers cease, field agents stop activities, farmers divided on advantages and disadvantages of Court action, administration upset by knocking out of benefit payments as well as processing taxes, Congress wondering what to do about it . . . Farley is accused of going after office holders for dinner fees . . . In Jackson Day address the President likens himself to Andrew Jackson in fight on the "forces of privilege and greed" . . . House passes veteran's lobby bonus bill 356 to 59, voting full cash payment and cancellation of interest on loans.

FOREIGN — Italian aviators bomb Swedish Red Cross hospital, killing two doctors and many native patients . . . Drop bombs near American Red Cross unit but without scoring any hits . . . Wealthy English Jews organizing plan to transport Jews of Germany to Palestine and English colonies . . . Brazil police hold pair accused of fomenting Communist uprisings throughout South America . . . Propaganda headquarters in Uruguay closed . . . Italian newspapers point out that Roosevelt is in no position to throw rocks at dictators . . . Five killed in Buenos Ayres general strike . . . French fleet ordered south in "spring maneuvers" before League oil ban is applied against Italy . . . 2,000 Italian army deserters escape into Jugoslavia.

FINANCE —British tobacco firm sues to recover over four millions lost when its reserve of gold bars was confiscated by Federal Reserve . . . Morgenthau intimates that he is working for international agreement on bimetallism . . . Morgan, Lamont and Vanderlip, before Nye Committee, testify that Wilson and Lansing established war credit policies and that the bankers acted in accordance with them . . . Treasury reports salaries of those getting more than $15,000 in 1934 . . . Securities make new highs on news of Supreme Court's AAA decision . . . Excess reserves and bank clearings rise sharply.

INDUSTRY —Hupp Motor suspends production pending raising of additional working capital . . . New York WPA finds that men on relief will not shift to private industry jobs . . . Westinghouse earned $12,000,000 in 1935, to pay $4.50 per share . . . Mayor LaGuardia of New York moves to secure local industrial disputes ordnance corresponding to Wagner Act, anticipating invalidation of latter by Supreme Court . . . Railroads bring suit to nullify rail pension law.

TRADE —Ford anounces new partial payment plan involving maximum monthly payment of $25, same interest rates as GM and Chrysler . . . Pan-American and most of the 23 domestic air lines will fly express under the coordinating supervision of the Railway Express Agency . . . Reciprocal trade treaty with Switzerland is signed.

INDICATORS —Steel output rises sharply to over 50 per cent capacity . . . Electric power output continues on its upward way . . . *Business Week's* index recedes one point to 72.8.

Watching Washington

Persistency of veterans makes bonus seem assured . . . AAA follows NRA into the discard . . . President's address to Congress opens Democratic campaign . . . Major Berry's second party is more exclusive . . . Townsend Plan storm brews

WASHINGTON—Even if you're in the minority, yell loud enough and long enough and you'll get what you want. That, at least, seems to be the lesson to be derived from the passing of the soldiers' bonus bill in the House, with every prospect of concurrence by the Senate and enough votes to spare to overcome a Presidential veto. The veterans will get their coveted cash promptly with interest waived on any borrowing against the face value of the original certificates. They may choose instead a three per cent interest bearing certificate, for the unpaid balance, to mature in 1945. In either case, they are free to seek more political worlds to conquer.

New Deal notions of an ordered economy received a second great jolt with the Supreme Court's out-and-out setback of the Agricultural Adjustment Act. The Administration had anticipated and even prepared for nullification of the processing taxes, but it did not dream the court would knock out farm benefit payments. This decision puts Democrats at the same comparative disadvantage in seeking farm votes next fall as the Republicans would have been under had the court allowed continuance of these payments. Before, it was cash in hand against a promise; now, it is one promise against another with the G.O.P. advantage that the Democratic plan has been discredited.

Taking the initiative away from Congress, President Roosevelt and Secretary Wallace, after a series of hasty consultations, brought forth a soil conservation plan which would retain the principle of controlled production. They declared against export debentures or "or any national policy that will result in shipping of our soil fertility to foreign lands." Whether the rural population can be appeased without some subsidy to replace the benefit payments remains to be seen. Many farmers regarded AAA as unsound but wanted something "just as good for their pocketbooks."

The Administration's chief problem now is to get the money agreed upon to the farmer somehow. Anything short of this would be close to political suicide because farm belt states are essential to Roosevelt's reelection.

Officially, the Jackson Day dinner of January 8, opened the 1936 Democratic campaign. Actually, the President beat the gun by five days in breaking precedent and arranging to have his message to Congress broadcast to the country from a special night session.

Forthright was the first part of his speech, in which he declared for a drastic neutrality law and, without mentioning names, arraigned severely certain foreign governments which have "impatiently reverted to the law of the sword."

While vague as to details, the message contained assurances to business by the absence of any request for additional social legislation and the statement that new taxes were neither necessary nor desirable. It did, however, ring with defiance to political enemies and a challenge to repeal his program. Those already New Dealward inclined saw in the address increased enthusiasm in Democratic ranks and a good effect on political mugwumps. Those opposed saw only a demagogic stump speech replete with the old trust-busting phrases, "intrenched greed," "autocracy towards labor," "private and selfish interests."

"Undignified," cried the critics. But, smart politics, they were forced reluctantly to admit in view of the well known appeal of the Rooseveltian radio voice. Unfortunately for the President the political coup was overshadowed by the Supreme Court AAA decision—so tremendously more important than his own remarks.

In fact his speech just "got under the wire." Having defied opposition to repeal his program, the President three days later saw the agricultural half of his New Deal follow NRA into oblivion. Ironically enough his budget message, calling for federal expenditures of $6,752,000,000, was delivered at the very moment Justice Roberts read the Supreme Court decision invalidating AAA and the processing taxes.

Almost unheard of in the face of vastly more vital news, Major Berry held another conference, renamed "Council for Industrial Progress." At sessions held behind closed doors for a select circle of industrialists and labor delegates, guaranteed not to be obstreperous, he urged caution against outside statements.

Big names in industry were conspicuous by their absence; Henry Dennison was almost the only nationally known executive present. However, labor was there full force, and meetings were conducted precisely as though the gathering was truly representative.

Committees of four industrialists and four labor men were appointed for each of the vital features of the old NRA—committees on national industrial policy, a maximum work week, general wage and child labor, fair trade practices, competition, anti-trust laws and financial aid to small enterprises.

Among the 120 present were over a dozen lawyers and many secretaries or paid officials of trade groups. Few came with authority to commit their group or to appear otherwise than as observers. It was obvious from the makeup of the attendance that nothing truly cooperative or representative of industry could result from the "council." Nevertheless, the Major has his face to save and eventually will pass along a report to the President. The danger is that one day this document may crop up in Congress, as a basis for legislation, labeled "the considered opinion of industry and labor in joint session assembled."

Dr. Townsend's move to provide for those over 60 has gained sufficient prominence so it can no longer be ignored. Timid politicians, anxious to alienate no votes, may break their silence. As a result the Townsend Plan was met upon the opening of Congress with unexpected barrage of opposition. Coming from many sources, the volume as well as the merits of the arguments are expected to make it clear to the voters that the plan is impractical.

Will Take Census of Farm Equipment

Director William L. Austin recently announced that the Bureau of the Census is to resume the annual collection of data relating to the production and sale of farm equipment and related products. The last collection of these statistics was made in 1931. This census is being taken at the request of the Farm Equipment Institute and of individual manufacturers of farm equipment. It is not to be confused with the biennial Census of Manufactures which is also to be taken for the year 1935.

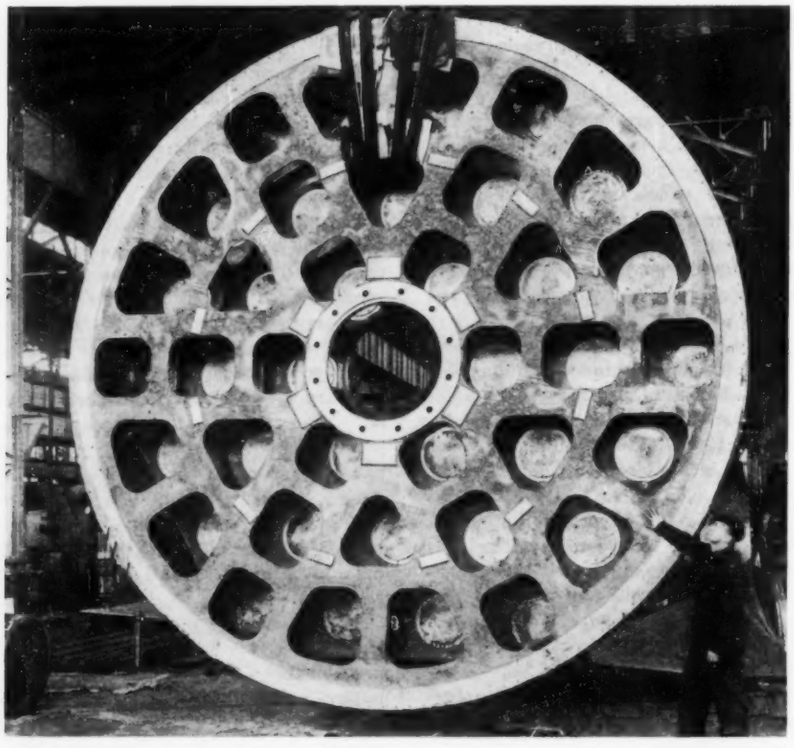
Board Studies Wages and Representation Plans

Earning power of American wage earners cannot be measured solely on the basis of hourly or weekly wages, according to the findings of the National Industrial Conference Board in connection with a recent nation-wide investigation of the industrial relations policies. This investigation, covering 2,452 business establishments and over 4,500,000 employees, shows that opportunities for increasing income are available to employees in a large proportion of business concerns. This represents the first release of data from the Board's census of industrial relations policies of companies which employ 15.5 per cent of those gainfully occupied in manufacturing, mining, public utilities, transportation and communication, wholesale and retail trade, and finance.

Plans of employee representation by which groups of company employees bargain collectively with company management have not been discontinued to any appreciable extent as a result of the Wagner Labor Relations Act.

Employee representation plans are in operation in 751 or about 30 per cent of the companies. These concerns employ nearly 60 per cent of all the workers covered.

Organized labor unions have agreements affecting a portion or all of the employees in 287 of the companies covered in the Board's investigation.



For Grinding a Glass "Eye"—The great glass mirror casting recently completed for the California Tech astronomical observatory must now be ground during tedious months of work. Here is the mirror cell and grinding table built and machined to utmost accuracy by the Eddystone Shops of the Baldwin-Southwark Corp., despite dimensions of 208 in. diameter, 24⅛ in. depth and a weight of 25,000 lb. Welded steel construction was employed

Three Appointed on Iron Research Group

Three representatives of the steel industry have been appointed to the Alloys of Iron Research Committee of the Engineering Foundation, which is carrying on world research embracing the entire body of knowledge of steel, alloy steel, alloy iron, and cast, wrought and pure iron. Dr. John Johnston, director of research of the United States Steel Corp., was named to the Committee to represent the American Iron and Steel Institute. Wilfred Sykes, a director of the Inland Steel Co., becomes a member-at-large, succeeding the late Dr. John A. Mathews, who was vice-president of the Crucible Steel Company of America. The other new member is James T. Mackenzie, metallurgist and chief chemist of the American Cast Iron Pipe Co., who takes the place of R. E. Kennedy, technical secretary of the American Foundrymen's Association.

Nearly 150 men, including some of the world's foremost specialists in alloy steels, physical and works metallurgists, physicists, chemists, engineers, and superintendents of alloy-steel plants, are cooperating with the Committee, of which Prof. George B. Waterhouse of Massachusetts Institute of Technology is chairman.

The Committee's collection of classified abstracts now numbers 15,300, with foreign languages translated into English. Six monographs have already been issued, nine are in preparation, and five more are planned.

Air Conditioning Breaks Records

While final figures are not yet available for the year just closed, tentative figures indicate that the record 1935 dollar volume of air conditioning equipment was at least 80 per cent greater than in 1934. 1935 saw the American public pay over $35,000,000 for air conditioning equipment.

Manufacturers in the textile, confectionery, chemical, packing, steel, and other industries are either planning to install air conditioning or are adding to their present air conditioning equipment in order to process their products more efficiently.

Beauty parlors, barber shops, restaurants, hotels, and similar service establishments where customer comfort is essential to sales, contributed in a large measure to the remarkable growth of business in the Air Conditioning Industry in 1935.

Motors AND OTHER MATTERS

Prospects bright for improved February auto production . . . Ford inaugurates new time payment plan . . . G. M. plans series of shows next month . . . Conservatism seen dominant in 1937 designs

BURNHAM FINNEY
Western Editor

DETROIT—Having slowed down for the Christmas holidays, the automotive production train again is getting up steam and should go whizzing through the first half of 1936 at a merry pace. The speed attained in January may not be up to that of November or early December, but February should bring further acceleration (with output hovering around 400,000 units). In March the throttle will be pushed wide open as the industry gets into the spring season.

January and February have been the two ogres leering at motor car executives in recent weeks. Indications are that the industry has figured out ways and means of keeping these two months from retarding too greatly the sweeping sales progress already made with 1936 models. Ford, in cooperation with Universal Credit, is sponsoring the $25-a-month plan for buying cars, giving purchasers of the V-8 a longer time in which to pay. Chevrolet is spending $1,000,000 this month to keep dealers' yards from becoming clogged with used cars. It is paying to dealers $20 for every old car, accepted in trade on a new or used car, which is scrapped or junked, a factory representative seeing that the ancient wrecks are broken up. It likewise is paying a bonus to dealers' salesmen for selling used vehicles.

Around February 1 General Motors will apply heat to a market which may be growing a bit cold by beginning a series of shows in 55 or 60 cities, each show being timed to suit the sales promotional requirements and climatic conditions of individual communities. These shows heretofore have been held simultaneously about April 1, but this year are being pushed ahead.

Despite the demise of the A.A.A., automotive leaders can't get very excited about the possibility of the farmer's purchasing power being curtailed. Much of the gain in car sales the past year has come from agricultural areas and the industry still is looking to the farming population for good sales during 1936. Even the conservatives are predicting that this year's automobile production will be 4,250,000 units, and most observers set a higher figure.

Radical Changes Deferred

While companies are concentrating on preparations for the spring season, plans for 1937 models are taking shape. For several months it has been the belief in Detroit that next year will see radical designs rather widely adopted, but latest developments disprove that theory. If rear-engine cars are put into production, they will be sponsored by makers with relatively small volume to test the public's taste. Should the reaction be favorable they will be more widely manufactured the following year.

Among the companies with large volume, particularly in the lower-price field, conservatism is expected to rule again in 1937. Managements figure the situation out about as follows: The industry is in a period of expansion, which should continue through 1937 as well as 1936, since the country is well on its way out of the depression. A substantial sales total is assured next year, even if changes are few. Why risk a possible set-back by pioneering with a product the public acceptance of which is yet to be proved?

Regardless of the definite sentiment in favor of sticking to present designs, with enough alterations to be able to talk about a "new" car, equipment buying this year will be heavy. Ford has contracted for machine tools for its new valve plant at Northville, Mich., at a cost of over $600,000, while Pontiac has bought machinery for its rear axle job. Considerable equipment has been placed for the Grand Rapids Stamping Division of General Motors.

It appears that buying for 1937 tooling programs will start in the next 30 days. This early action is attributable to fall introductions of 1937 cars and to the desire of automobile makers to get deliveries of equipment on time, now that machine-tool builders are so busy. Packard's machine program is moving slowly and there seems little likelihood that any purchases will be made for several weeks. Ford will be a big factor in the equipment market in the months ahead. Chevrolet, too, will make enough changes for next year to necessitate large expenditures, although the present motor will be retained with improvements. Chrysler, which has bought little machinery the past year, probably will make a considerable outlay for new tools this year. Inquiries, in fact, are so numerous that the problem facing machine-tool builders is one of making deliveries rather than of soliciting new business. Briggs Mfg. Co. is expected to buy equipment soon for its new die shop now being erected.

A significant development, which may have an important influence on the future design of machine tools, is the insistence of a prominent car manufacturer that the weight of the tools be cut down wherever possible. It has had delivered to it lately several large machine tools in which a saving of about fifteen per cent in weight has been effected by constructing arms, brackets, doors and other accessories of aluminum alloys. No attempt has been made to reduce the weight of the base, consequently smooth operation of the machines has been maintained.

Buying Based on Tests

It is an encouraging sign that several large metal-working companies are buying smaller products, such as drills, taps and hacksaw blades, on a more scientific basis than heretofore. Laboratory tests are conducted to discover the merits of one product compared with another, these tests serving as the basis for making purchases. How much better is this practice than the old custom of favoritism or of buying on price alone. Companies today are searching as never before for ways and means of lowering costs and improving quality. What an opportunity for manufacturers of new products to get a fair hearing and for older manufacturers to push forward if their products have the quality claimed for them.

Oriental Show—Japanese plant executives, who could not make the trip to Cleveland last September, have an opportunity to see some of the machines displayed there in the tri-city exhibit held by Andrews & George Co.

Japan Sees Tabloid Machine Tool Show

For the benefit of Japanese users of metal-working machinery, the firm of Andrews & George Co., sole representatives in Nippon of many American equipment manufacturing concerns, is conducting a traveling machine tool show. The exhibit, which requires over 1600 sq.ft. of floor space and includes machines weighing well over 33 tons, is a small edition of the Machine Tool Show held in Cleveland last September. Much of the equipment on display is being shown in Japan for the first time; machines are run to demonstrate features for increased productivity, accuracy and ease of control.

The show opened in Tokyo on November 6 and continued until December 15. During January and February, a second showing is being held at Osaka. The final exhibit will be made in Nagoya in March and April.

Some of the concerns represented by Andrews & George in Japan are the Abrasive Machine Tool Co., E. Providence, R. I.; Blanchard Machine Co., Cambridge, Mass.; Andrew C. Campbell, Bridgeport, Conn.; Cincinnati Bickford Tool Co., Cincinnati, Ohio; Cincinnati Milling Machine & Cincinnati Grinders Inc., Cincinnati, Ohio; Cincinnati Shaper Co., Cincinnati, Ohio; Federal Products Inc., Providence, R. I.; Hoskins Mfg. Co., Detroit, Mich.; E. F. Houghton, Philadelphia, Pa.; Hunter Saw & Machine Co., Pittsburgh, Pa.; Jones & Lamson Machine Co., Springfield, Vt.; Landis Tool Co., Waynesboro, Pa.; National Automatic Tool Co., Richmond, Ind.; Porter-Cable Machine Co., Syracuse, N. Y.; Pratt & Whitney Co., Hartford, Conn.; Production Tool Co. of America, Detroit, Mich.; Racine Tool & Machine Co., Racine, Wis.; Tinius Olsen Testing Machine Co., Philadelphia, Pa.; Torrington Co., Torrington, Conn.; and Wilson Mechanical Instrument Co., New York, N. Y. That so many representative firms are cooperating should make for a well-rounded exhibit.

Argentine Surtax Hurts U.S. Machinery Trade

Exchange restrictions will continue to hamper machinery trade with the Argentine during 1936, according to a report from the Buenos Aires office of the U. S. Department of Commerce. As matters now stand, practically all American machinery must be quoted on the basis of free market exchange plus the surtax of the difference between the official market rate and 20 per cent over and above that rate. European manufacturers, particularly Great Britain and Germany, benefit because they will continue to quote on the basis of the official exchange rate, or approximately 20 per cent below our manufacturers. The only hope of American exporters is that the favorable trade balance that Argentina now holds with the United States will be improved so that a more liberal distribution of the official exchange may be accorded to the United States.

Bullard Wins in Supreme Court

The Supreme Court, on December 19, 1935, refused to review the decision of the lower courts in a suit brought by Joseph T. Ryerson & Son against The Bullard Company under Conradson Patent No. 1,140,299. Both lower courts had held the Conradson patent invalid.

James M. Acklin Dies

James M. Acklin, president of the Acklin Stamping Co., Toledo, Ohio, was killed in an automobile accident near Lexington, Ky., on Jan. 10.

H. P. Charlesworth Heads Engineering Foundation

At the election of officers for 1936, the Engineering Foundation, research organization of the national engineering societies, reelected H. P. Charlesworth, assistant chief engineer, the American Telephone & Telegraph Co., as chairman. D. Robert Yarnall of the Yarnall-Waring Co. was chosen vice-chairman and Alfred D. Flynn continues as director and secretary. Among the eight members of the board nominated by the Founder Societies, those for the American Society of Mechanical Engineers are: Walter H. Fulweiler, chemical engineer, the United Gas & Improvement Co., and Albert E. White, professor of metallurgical engineering, University of Michigan.

Machinery Session at Packaging Meeting

Outstanding problems involved in packaging machinery will be spotlighted in a special session of the four-day conferences, clinics and round-table meetings sponsored by the American Management Association concurrently with its Sixth Packaging Exposition at the Hotel Pennsylvania, New York City, March 3 to 6. A full morning session will be devoted to the subjects of direct interests to this division of the packaging industry, which does a gross annual business of around $10,000,000.

A committee of machinery makers has worked out the details of this special session which will run concurrently with the Packing and Shipping session on Thursday, March 5.

A.M.A. Groups Meet to Discuss "Today's Major Personnel Problems"

Collective bargaining and old age security are but two of the many live topics on personnel and industrial relations policy to be discussed at the Mid-Winter, Mid-West Conference to be held February 5, 6 and 7, under the direction of the Personnel and Office Management Divisions of the American Management Association. The Industrial Relations Association of Chicago is cooperating. Headquarters will be the Palmer House, Chicago.

Speakers and program are as follows:

WEDNESDAY, FEB. 5

Morning Session—Grand Ball Room

Harold B. Bergen, director of industrial relations, the Procter & Gamble Co., presiding.

10:00 a.m. Basic Principles and Considerations in Industrial Relations.

Speaker: Tom M. Girdler, chairman of the board, Republic Steel Corporation.

Afternoon Session—Grand Ball Room
Collective Bargaining

Harvey Ellerd, director of personnel, Armour and Co., presiding.

2:00 p.m. Legal Aspects of the National Labor Relations Act.

Speaker: William H. Spencer, dean, School of Business, University of Chicago.

3:00 p.m. Recent Developments and Trends in Collective Bargaining.

Speaker: To be announced.

Leader of Discussion:

C. L. Eubank, director, Industrial Relations Department, Kimberly-Clark Corporation.

Dinner Meeting—The Club Dining Room, Club Lounge Floor

Management's Responsibilities in a Social-Minded World

James O. McKinsey, chairman of the board, Marshall Field & Co., presiding.

7:00 p.m. What is Management's Real Job? The Distribution of Wealth and Income.

THURSDAY, FEB. 6

Morning Session—Grand Ball Room

H. W. Story, general attorney, Allis-Chalmers Manufacturing Co., presiding.

9:30 a.m. To What Extent Will State Laws Relieve the Unemployment Problem?

Speaker: M. B. Folsom, treasurer, Eastman Kodak Co.

Leader of Discussion:

A. S. Hansen, consulting actuary.

Afternoon Session—Grand Ball Room
Old Age Security

Arthur H. Young, vice-president in charge of industrial relations, United States Steel Corporation, presiding.

2:00 p.m. Basic Philosophy of the Federal Old Age Security Program.

Speaker: J. Douglas Brown, director, Industrial Relations Section, Princeton University.

3:00 p.m. The Adjustment of Company Plans to the Federal Plan.

Speakers: From companies that have worked out their programs.

Leaders of Discussion:

George Kelly, vice-president, The Pullman Co.

Frank L. King, comptroller, Continental Illinois National Bank and Trust Co. of Chicago.

FRIDAY, FEB. 7

Personnel Management Round Table
Disussions—Grand Ball Room

9:30 a.m. What's New in Selection Methods?

Chairman and First Speaker: Dr. Samuel N. Stevens, director, The University College, Northwestern University.

Leaders of Discussion:

Richard S. Uhrbrock, head of research department, Industrial Relations Division, The Procter & Gamble Co.

Dr. L. L. Thurstone, Psychology Department, University of Chicago.

Dr. Robert N. McMurray, secretary, Chicago Office, Psychological Corporation.

11:30 a.m. Today's Wage and Compensation Problems.

Chairman and First Speaker: Eric A. Nichol, manager of personnel. The Philadelphia Gas Works Co.

Leader of Discussion:

Edward N. Hay, personnel officer, The Pennsylvania Co.

2:00 p.m. What's New in Training Techniques?

Chairman and First Speaker: L. A. Appley, director of training, Socony-Vacuum Oil Co., Inc.

Leader of Discussion:

A. B. Gates, director of training, Eastman Kodak Co.

Office Management Clinic—The Club Lounge

George L. Harris, manager of sales research and systems department, Addressograph-Multigraph Corporation, presiding.

9:30 a.m. Office Management Problems Created by Recent National and State Legislation.

Speaker: The chairman.

10:15 a.m. What Personnel Records are Essential Today?

Speaker: Harold C. Pennicke, associate, W. H. Leffingwell, Inc.

11:00 a.m. and 2:00 a.m. Personnel and Payroll Records — Procedures, Forms, and Use of Machines.

Machine Tool Orders Maintain Recent Level

Preliminary figures from the National Machine Tool Builders Association show the same level of business in December as in November. The total index was 98.6, the same as for the previous month. The ratio of domestic to foreign business was also unchanged, the domestic index being 79.0 and the foreign index 19.6. One hundred and twenty-nine companies contributed information whereas the previous month the number was 144 companies.

Industrial Review

• **DELAYED DELIVERY**, a threat to machinery and machine tool business for some months, is taking effect seriously with the opening of the new year. One large distributor is bemoaning the loss of business amounting to approximately $100,000 because of his inability to meet the delivery dates promised by competitors. Word from all industrial centers is that January business is opening up as well or better than had been expected. Washington is being watched carefully with the expectation that Supreme Court decisions on New Deal laws will be helpful, and new legislation likely to be otherwise.

• **THE NEW ENGLAND** territory is expected to place more business in 1936 than for several years according to Boston agents who say that the first two weeks of January opened in a very satisfactory manner. The same situation exists in the Metropolitan district, New York distributors having divided some sizable orders, notably that of American Locomotive Company, among them. Opinions differ in Pittsburgh but the consensus is that January started off about as had been expected. Some distributors had more business than they anticipated, others less. Cleveland reports the best level of industrial activity since May 1930 and the confident expectation that it will be maintained. Cleveland industry is much encouraged by the success of the new administration in stamping out labor racketeering with its adverse effect on delivery.

• **DETROIT MACHINERY** business has been sagging somewhat during the holiday period but the general expectation is that the latter part of January will see a considerable revival. In Cincinnati inquiries are holding up well and orders are about what had been expected. Delayed deliveries are causing considerable annoyance. The general feeling in St. Louis is cheerful and optimistic although the first fortnight of January was rather quiet. A fair sized order for vocational school equipment is to be placed shortly.

• **CHICAGO DISTRIBUTORS** look forward to a very satisfactory January, basing their optimism on the inquiries on hand. A fair amount of business has already been placed. Word from Milwaukee is to the effect that the year-end was rather dull and that Congressional uncertainties are delaying an active revival. In San Francisco a machinist strike has tied up several shops. Despite this handicap January is expected to be a fair month.

Nazi Oil Tariffs Penalize Diesels
Siemens Wage Plan Fails

BERLIN—The German diesel motor industry is facing a serious problem. Almost overnight, and without consulting any of the interests concerned, the German Government has raised by 100 per cent the import duties on gas oil (diesel oil).

From the tariff viewpoint, the diesel motor heretofore occupied a privileged position in Germany. The import duty on diesel oil—4 marks per 100 kilograms—was only one-fourth of that on gasoline. Consequently, the price relation between gas oil and gasoline was 1:3 in Germany as against 2:3 in most other countries where there were no import duties or where the tariff rates for both kinds of motor fuel were approximately equal. This added to the advantage of more economic operation which the diesel motor possesses against the gasoline motor. The tariff increase is from 4 to 8 marks per 100 kilograms which automatically raised German gas oil prices by 20 to 25 per cent.

The main motive in raising the tariff rate on gas oil was to encourage domestic oil production. Of all gasoline consumed in Germany 25 per cent comes from domestic sources, while in the case of gas oil this percentage is only 15. The development of domestic resources of motor fuel is naturally considered of particular importance for raising Germany's self-sufficiency in case of war. On the other hand, it has been openly admitted that it is desirable to check the "triumphal advance" of the diesel motor in Germany which also from the military viewpoint is considered undesirable. Preference should be given to steam and electricity as power generators since they are independent of foreign fuel supplies in war time.

Germany still does not possess (or, at least, does not publish) any complete statistics of diesel motor production. The old Diesel Motor Association comprised 12 principal builders of diesel engines producing about 80 per cent of the total output. It did not, however, embrace automobile manufacturers making their own diesel engines. But in a recent issue the *Frankfurter Zeitung* published the following interesting figures of diesel engine *sales* (in hp.) in the years 1928 to 1934:

Sales of Diesel Engines

	Domestic 1,000 hp.	Foreign 1,000 hp.
1928	138.2	248.0
1929	148.7	366.1
1930	129.1	385.1
1931	118.0	218.4
1932	94.2	131.7
1933	284.4	228.5
1934	486.7	280.7

Sales figure for the last three years are highly characteristic of the main trends of German industrial recovery. While exports of Diesel engines increased by 115 per cent, domestic sales registered an increase by 410 per cent. In 1935 this tendency was probably maintained, inland sales showing greater gains than exports. Nevertheless, the competitive position of the German diesel in world market will depend to a large extent on the capacity of the domestic market.

German diesel engine makers are, therefore, carefully appraising the possible effects of the doubled gas oil import duties, and of higher domestic prices, on the use of diesel engines in Germany. It is the consensus of opinion that the effect on engines for motor vehicles will be almost nil as the margin of profitable operation which has led to an almost complete elimination of the gasoline engine for trucks is so considerable that the oil price increase has only insignificantly changed their present relative competitive position.

The outlook in regard to stationary diesel engines is much more gloomy. Diesel-operated electric plants already have very severe competition from electricity generated by steam and water-power. The narrow margin they still possessed with the lower import duty may now be altogether wiped out.

Siemens' Abortive Wage Reform

German machinery builders have in the last two months been following with great interest an experiment carried on by the Siemens electrical concern.

It is one of the acknowledged goals of Nazi labor policy to make the position of workers more stable and more akin to that of salaried employees. The commendable purpose of this reform is to strengthen the ties which unite the worker with the plant in which he is working. It is to be

Exports of Machinery During November, 1935

	November 1935	October 1935	November 1934
Electrical machinery and apparatus	$7,475,827	$7,256,235	$6,814,603
Power generating machinery (except automotive and electric)	655,668	911,585	980,303
Construction and conveying machinery	763,778	682,855	416,153
Mining, well and pumping machinery	2,464,969	2,430,059	2,373,085
Power-driven metal-working machinery	3,923,375	2,624,958	1,549,097
Other metal-working machinery	348,243	324,544	174,063
Textile machinery	915,667	862,542	522,969

Exports of Metal-Working Machinery During November, 1935

	November 1935	October 1935	November 1934
Engine lathes	$128,717	$124,049	$80,923
Turret lathes	107,523	105,906	37,084
Other lathes	104,224	72,221	50,588
Vertical boring mills and chucking machines	130,647	69,222	30,090
Thread-cutting and automatic screw machines	268,834	236,116	32,916
Knee and column type milling machines	90,736	81,271	43,455
Other milling machines	358,428	205,389	89,183
Gear cutting machines	175,200	128,110	143,633
Vertical drilling machines	220,119	7,512	16,672
Radial drilling machines	11,413	6,700	5,130
Other drilling machines	226,446	102,382	63,625
Planers and shapers	71,227	33,354	22,685
Surface grinding machines	194,404	133,509	31,822
External cylindrical grinding machines	80,061	107,606	15,694
Internal grinding machines	198,086	164,878	64,326
Tool grinding, cutter grinding and universal grinding machines	250,699	75,491	73,282
Other metal grinding machines	59,088	61,705	43,959
Sheet and plate metal-working machines	193,127	115,357	151,544
Forging machinery	113,787	68,604	76,405
Rolling mill machinery	246,270	283,487	169,673
Foundry and molding equipment	328,883	112,303	67,439
Other power driven metal-working machinery and parts	365,456	329,786	239,009

Other Metal-Working Machinery

Pneumatic portable tools	$67,385	$69,000	$45,915
Other portable and hand or foot operated metal-working machines and parts	81,349	46,283	39,735
Chucks for machine tools	25,415	20,310	12,037
Machine operated pipe and thread cutters, stocks, dies, taps, and other machine-operated cutting tools	123,016	153,050	56,888
Other metal-working machine tools	51,078	35,901	19,488

achieved, in the first instance, by paying the workers a monthly salary instead of weekly or daily wages.

Under considerable party pressure, the Siemens concern agreed to try out the experiment. Since, however, piecework was not to be abandoned and since, on the other hand, it was considered impossible that the workers, not accustomed to this innovation, should have to wait for their pay a whole month, a compromise was arrived at. On the 10th and 20th of each month Siemens would pay "on account" an amount roughly corresponding to the wages earned during the 10-day period. Accounts would be settled with the third and last payment which was also to include any balance still due the worker.

Another argument, of a more general nature, was also adduced in favor of the new system. It was asserted that the present system of wage payments unnecessarily increases the "load" of retail trade on Fridays and Saturdays, while payments by 10-day periods, made on different days of the week, would tend to spread the workers' and their families' purchases more evenly over a greater period.

Two months after this new method of wage payment was introduced, industry was startled by the announcement that it had been abandoned and that Siemens had returned to the old method of weekly payments.

The plan was from the beginning intensively disliked by the Siemens workers in whose interests the Nazis thought they were acting when urging Siemens to try out the experiment. Weekly wage payments proved so intrenched in the habits of the workers and their families that the latter were anything but enthusiastic about this breach with the old tradition.

Texas Tech Stages Welding Conference

All persons interested in welding are invited to attend the Second Annual Welding Conference at the Texas Technical College, Lubbock, Texas, on February 13 and 14. Lectures and motion pictures on various phases of welding are to be in the mornings, exhibits and demonstrations will be in the afternoon. There will not be any charge for the Conference. Preparations are being made for an attendance of five hundred. Ample hotel accommodations can be obtained at reasonable rates.

Inquiries should be addressed to J. C. Hardgrave at the college.

PERSONALS

ROBERT B. SKINNER is now vice-president and general manager of the D. E. Whiton Machine Co., manufacturers of chucks, centering machines, gear cutters, castings and turbines. Mr. Skinner was formerly secretary and sales manager of the Skinner Chuck Co. He is now associated with LUCIUS E. WHITON, president, and this circumstance brings together the descendants of two of the original chuck manufacturers. Bob Skinner, as he is known to his many friends, has been in the chuck business ever since he left school and has come in contact with all phases of the manufacturing and distributing end of the business. Moreover, he has been active in the American Supply and Machinery Manufacturers Association for upward of 20 years and in 1927 was president.

J. E. N. HUME, assistant manager of the industrial department, General Electric Co., has been appointed manager of that department to succeed the late W. W. MILLER. Mr. Hume has been assistant manager for the last six years. He entered the department in 1912 and has been there ever since.

GEORGE H. REID has been appointed industrial department manager of the New York district to succeed FRED S. HARTMAN, who retired at the close of the year. Mr. Reid entered General Electric's employ in 1901 and was made assistant manager of the industrial department in the New York district late in 1923.

CHESTER F. HOCKLEY, who has been president of the Bartlett Hayward Co. since 1931, has retired to become president of the newly reorganized Davison Chemical Corp. He will, however, continue as a director, according to the announcement of Howard Bruce, chairman of the board.

WALTER F. PERKINS, formerly vice-president and general manager, has been elected president. He joined Bartlett Hayward in 1914 and rose through various positions to that of general superintendent, which he resigned in 1927 to become manager of the Harrison Works of the Worthington Pump & Machinery Corp. He returned in 1932 as vice-president and general manager.

W. C. MORGAN, superintendent of the machine shop, the Magnolia Petroleum Co., Electra, Texas, has been promoted to district superintendent of shops for that company in North Texas and Oklahoma, with headquarters in Dallas.

Joins Whiton Machine

ROBERT B. SKINNER

G.E. Industrial Manager

J. E. N. HUME

N. Y. Industrial Manager

GEORGE H. REID

Now IBM Vice-President

WALTER F. TITUS

Wrote NRA News

WALLACE THOMPSON

Headed Waukesha Motors

HARRY L. HORNING

WALTER F. TITUS, executive assistant, International Business Machines Corp., has been promoted to the position of vice-president in charge of manufacturing. L. S. HARRISON, manager of engineering, has been appointed assistant to the president.

CHESTER A. CAHN, an attorney, has been named secretary of the Automotive Tool & Die Manufacturers Association, Detroit.

W. G. R. BAKER has been appointed managing engineer of the General Electric Company's radio receiver section, covering both the engineering and manufacture of this product. For the past few years Mr. Baker has been connected with the RCA-Victor Co., Camden, N. J.

FREDERICK W. NEILSON, general manager of the Sikorsky Aviation Corp., Stratford, Conn., has been elected vice-president of the United Aircraft Mfg. Co., East Hartford. E. E. WILSON succeeds Mr. Neilson, but will have offices at Hartford. R. W. CLARK remains at the Sikorsky plant as assistant general manager. THOMAS MURPHY has resigned as factory manager.

DR. A. A. POTTER, dean of Schools of Engineering, Purdue University, has been unanimously nominated as president of the American Engineering Council for 1936-37, to succeed J. F. COLEMAN, of New Orleans. Dean Potter will take office at the annual meeting of the Council to be held Jan. 9-11. He is a past-president of the American Society of Mechanical Engineers, the Society for the Promotion of Engineering Education, and other technical bodies.

FRANK W. CURTIS, who joined Firth-Sterling Steel Co. last Fall, has been made manager of the Firthite Division and will be in charge of engineering, sales and development of Firthite sintered carbide.

OBITUARIES

Wallace Thompson Dies

Wallace Thompson, editor and author, died on January 7 at his home in New York City. During the existence of the National Recovery Administration, Mr. Thompson was NRA correspondent at Washington for the McGraw-Hill Publishing Company. Many of the accounts on these pages dealing with that defunct government bureau originated from his pen.

Born in Topeka, Kansas, 53 years ago, Mr. Thompson came to New York in 1903 to become assistant editor of the magazine *Modern Mexico*. In 1904, he became news editor of the *Mexican Herald*, published in Mexico City. He was appointed political correspondent for the Kansas City *Journal* in 1910, and from 1911 to 1913, was Paris correspondent for various American newspapers.

In 1914 Mr. Thompson returned to New York to become managing editor of *Town & Country*. Later he held a similar position with *Popular Science Monthly*. In 1917 he was a member of the Doheny Research Foundation in Mexico, and the following year served in the War and State Departments in Washington. He was then appointed U. S. Vice-Consul at Monterey, Mexico, and in suceeeding years wrote several books on that country and its people.

Since 1927, Mr. Thompson has been editor-in-chief of *Ingeneria Internacional*, a Spanish language paper.

HARRY L. HORNING, president and founder of the Waukesha Motor Co., died Jan. 4 at the age of 55. Mr. Horning was a past-president and honorary life member of the Society of Automotive Engineers, the American Society for Testing Materials, and a past-president and director of the Motor and Equipment Manufacturing Association.

J. G. OBERMIER, vice-president in charge of production, and a member of the board of directors, the Timken Roller Bearing Co., Canton, Ohio, died Dec. 28 at Tucson, Ariz., of pneumonia. He joined the Timken organization in 1912 as superintendent of production and was personally responsible for many of the plant efficiencies that have played an important part in the growth of that organization. He reached his last office in 1921 and was actively engaged until a few weeks ago.

FRED W. BARTELSMEIER, 73, plant superintendent of the Heisler Locomotive Works, Erie, Pa., for more than 30 years, died at Rochester.

CHARLES I. HODGSON, 48, vice-president of the Doehler Die Casting Co., and superintendent of the company's Batavia, N. Y., plant, died Dec. 29.

FRED H. MERRELL, 72, a founder of the Seneca Chain Co., Kent, Ohio, died Jan. 3. He was also a founder of the Kent Machine Co.

JOSEPH S. REID, 67, president and treasurer of the Clark Brothers Co., Olean, N. Y., manufacturers of sawmill machinery and oil-well pumping equipment, died recently.

JACK ESPEN, a member of the Espen-Lucas Machine Works, Philadelphia, Pa., manufacturers of boring machines and saws, died Dec. 24.

JOHN C. FERGUSON, 66, president and general manager of the Eclipse Machine Co. from 1928 to 1933, died January 7 at Elmira, N. Y.

MEETINGS

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Winter Convention, January 28-31. Engineering Societies Building, New York, N. Y. H. H. HENLINE, national secretary, 33 West 39th St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION. Conference on personal and industrial relations, Feb. 5-6. Palmer House, Chicago, Association headquarters, 20 Vesey St., New York.

AMERICAN SOCIETY FOR TESTING MATERIALS. 1936 regional meeting, Hotel William Penn, Pittsburgh, Pa. Symposium on high-strength constructional metals. B. L. WARWICK, secretary-treasurer, 260 So. Broad St., Philadelphia, Pa.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION. Annual meeting, Feb. 8. Cleveland Hotel, Cleveland, Ohio. ARTHUR J. TUSCANY, executive secretary, Cleveland, Ohio.

NATIONAL OIL BURNER SHOW. April 14-18. Convention Hall, Detroit. G. HARVEY PORTER, managing director, Oil Burner Institute, Inc., 30 Rockefeller Plaza, New York, N. Y.

USED MACHINERY DEALERS. The annual meeting of the National Association of Used Machinery and Equipment Dealers will be held on the 17th floor of the William Penn Hotel, Pittsburgh, Pa., at 10 a.m., Jan. 18, for the election of officers and directors. M. D. TOOLE, acting secretary, 55 Water St., Pittsburgh, Pa.

EXPORT OPPORTUNITIES

Breakfast food machinery for making wheat and oat foods. (Purchase.) Paris, France. *9911.

Cotton-seed-oil machinery, including huller, separator, oil expeller and steam boiler. (Purchase.) San Fernando, Venezuela. *9940.

Egg breaking, drying and freezing machines. (Purchase.) Karlovy Vary, Czechoslovakia. *9939.

Ice-cream manufacturing machinery. (Agency or purchase.) Saint John, Canada. *9938

Potato graders, washers, dryers and packers. (Purchase.) Saint Malo, France. *9937.

Sugar cane mill, centrifugal, hand-operated, with cane and bagasse conveyors. (Purchase.) Monrovia, Liberia. *9936.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office.

BUSINESS ITEMS

The Goddard & Goddard Co., Inc., Detroit, Mich., manufacturers of milling cutters, has appointed H. F. RUETER, 16905 Hilliard Road, Cleveland, Ohio, as representative in the northern half of that state. E. G. DORAN, 1618 W. Fulton St., Chicago, is now representative in the state of Iowa, the northern half of Illinois and the northwest corner of Indiana.

The Triplex Machine Tool Corp., 125 Barclay St., New York, American agents for Swiss jig borers, has appointed the following exclusive agents: Jeffery-Gilles, Inc., Cleveland, Ohio; W. E. Shipley Machinery Co., Philadelphia, Pa.; F. W. Schiefer Machinery Co., Rochester, N. Y.; Marshall & Huschart Co., Indianapolis, Ind.; Barney Machinery Co., Pittsburgh, Pa.; H. A. Smith Machinery Co., Syracuse, N. Y., and the Galvin Machinery Sales, Buffalo, N. Y. These agents supplement others already established in large cities.

Schick Dry Razor Co., Stamford, Conn., has acquired a site and will build a factory at St. John's, New Brunswick, Canada. The Canadian company will be known as Schick Dry Shaver, Ltd.

The Hartford (Conn.) Tool & Die Co., recently incorporated with an authorized capital of $50,000, was incorporated by Edwin M. Ryan, 650 Main St., Hartford. The company has already purchased machinery.

Plaskon Company, Inc., is the new name of Toledo Synthetic Products, Inc. The company started business in 1930. A New York office has been opened at 41 East 42d St. Home offices of the company are at Toledo, Ohio.

The Hedstrom Union Co., Gardner, Mass., has announced the removal of the coach department, East Templeton, and the metal gear department, Gardner, to Beacon, N. Y. Operations will now be centered at Fitchburg and Gardner, Mass., and Beacon, N. Y.

PATENTS

December 24, 1935

Metal-Working Machinery

Gear Cutting Machine. Samuel W. Avis, Providence, R. I., assigned to Brown & Sharpe Manufacturing Co. Patent 2,025,034.

Gear Cutting Machine. Samuel W. Avis, Providence, R. I., assigned to Brown & Sharpe Manufacturing Co. Patent 2,025,035.

Control for Contour Reproduction. Edgar D. Lilja, Rockford, Ill., assigned to Howard D. Colman. Patent 2,025,062.

Metal Cutting Machine. Edgar E. Nygren, Cleveland, Ohio, assigned to the Foote-Burt Co. Patent 2,025,070.

Template-Controlled Apparatus. James L. Anderson, Closter, and Charles T. Evans, Jersey City, N. J. Patent 2,025,082.

Multiple Spindle Stationary Work Turning Apparatus. Edward P. Bullard, Bridgeport, Conn., assigned to the Bullard Co. Patent 2,025,268.

Machine Tool. Frank A. Statz, Fort Wayne, Ind., assigned to International Harvester Co. Patent 2,025,536.

Finishing Tool. Ernest J. Lees, Cleveland, Ohio, assigned to the Lees-Bradner Co. Patent 2,025,688.

Tools and Attachments

Rotary Cutter. Joseph M. Redlinger, Providence, R. I. Patent 2,025,308.

Processes

Program Control of Nitriding. Lorenz O. Stammberger, Utica, N. Y., assigned to Leeds & Northrup Co. Patent 2,025,134.

Welding System. Claude J. Holslag, South Orange, N. J., assigned to Electric Arc Cutting & Welding Co. Patent 2,025,207.

December 31, 1935

Metal-Working Machinery

Machine Tool. Christian A. Birkebak, Detroit, Mich., assigned to Ex-Cell-O Aircraft & Tool Corp. Patent 2,025,706.

Grinding Machine. George W. Binns, Cincinnati, Ohio, assigned to Cincinnati Grinders, Inc. Patent 2,025,714.

Pattern Controlled Mechanism and Tracer Therefor. Wilfred H. Howe, Winchester, Mass., assigned to Atlantic Precision Instrument Co. Patent 2,025,748.

Drill Press. Herbert E. Tautz, Milwaukee, Wis., assigned to The Delta Manufacturing Co. Patent 2,025,834.

Milling Machine Transmission and Control Mechanism. Erwin G. Roehm, Norwood, Ohio, assigned to The Cincinnati Milling Machine Co. Patent 2,025,902.

Grinding of Rotating Eccentric Knives. Ernst Curt Muhbauer, Deptford, London, England. Patent 2,026,096.

Mold Engraving Machine. Thomas H. Williams, Akron, Ohio, assigned to National Rubber Machinery Co. Patent 2,026,487.

Tools and Attachments

Globoidal Hob. Samuel I. Cone, Portsmouth, Va. Patent 2,026,215.

Supporting Gauge-Plate for the Measurement of Dimensions of Bodies Bounded By Parallel Surfaces. Karl Buttner, Jena, Germany, assigned to Carl Zeiss. Patent 2,026,374.

Tool Clamping and Ejecting Device. Fernand Turrettini, Bellevue, Switzerland, assigned to Societe Genevoise d'Instruments de Physique. Patent 2,026,448.

Die Head. Otto Hoelzel, New Haven, Conn., assigned to The Eastern Machine Screw Corp. Patent 2,026,471.

Valve-Seat Facing Tool. Hugh M. Albee, Orange, Mass., assigned to the Levitt Machine Co. Patent 2,026,488.

Processes

Method of and Apparatus for Electric Spot Welding. Charles E. Hathorn Kenmore, N. Y., assigned to Curtiss Aeroplane & Motor Co. Patent 2,025,744.

Process of and Apparatus for Welding. George T. Southgate, Forest Hills, N. Y., assigned to Union Carbide & Carbon Research Laboratories, Inc. Patent 2,025,785.

Projection Welding. Frederick L. Creager, Camden, N. J., assigned to Radio Corp. of America. Patent 2,026,122.

Machine Requirements and Industrial Construction

EQUIPMENT WANTED

Del., Laurel—Mitchell's Garage, Roy Mitchell, Owner—wrecking crane, air compressor, drill press, portable drill and small tools.

Md., Hunger—R. C. Bell and Luther Mills—transmission, conveying and power machinery and equipment for oyster packing plant.

Neb., Omaha—Gate City Iron Works, 11th and Seward Sts.—electrically driven traveling cranes.

N. H., Hinsdale—Hinsdale Paper Mfg. Co., L. D. Stearns, Treas.—paper manufacturing machinery.

N. Y., Elmira—Elmira Precision Tool Co., Inc., R. T. Lewis, Pres.—screw machines, automatic; lathes; drills, transmission and conveying equipment.

N. Y., Jamestown—O. T. Colander & Sons, 321 Crescent St., C. O. Colander, Supt.—lathe, portable drills, grinding machine.

N. Y., Kirkwood—George Rolfe, Route 1—medium or large grinding machine.

N. Y., LeRoy—Veitel Silk Hosiery Co., 24 West Main St.—looms, transmission and conveying equipment, motors, etc.

N. Y., Syracuse—Brown, Lipe, Chapin Co., West Fayette St., division of General Motors Corp., Detroit, Mich.—equipment for manufacture of automotive equipment for General Motors cars.

N. Y., Westfield—Allen Drilling Co., 161 West Main St., Floyd L. Allen, Supt.—portable electric light plant: diesel drilling engines (may purchase gasoline engines); blower and pumping outfit, also winch.

O., Columbus—Ra-Loy Spark Plug Co., Inc., 8 East Broad St., R. Miller, Mgr.—boring, milling, drilling, cutting off, grinding and other machinery.

Pa., Bradford—Sloan & Zook Co., H. L. Smith, Supt.—gas and gasoline engines, compressors, power plants and other equipment for proposed repressuring system in Sugar Creek Township, Venango Co., oil field.

Pa., Fairview (Erie Co.)—Donald Hinkle—woodworking machinery and equipment for manufacture of baskets.

Pa., Grove City—Harold L. Uber, Route 3—lathes, drills, presses, transmission and conveying equipment for installation in plant for manufacture of electrical products.

Pa., Titusville—Cyclops Steel Co., C. T. Evans, Pres.—in market for $40,000 to $50,000 worth of steel products manufacturing machinery and equipment.

Pa., Williamsport—Williamsport Silk Co., 1627 Memorial Ave., A. Markgraf, Supt.—150 automatic silk looms.

Ont., Kingston—Frontenac Quarries, Ltd., John C. Reynolds, Pres.—quarry machinery.

Que., Amos—J. P. Norrie, P. O. Box 187—two 200 hp. transformers with switching equipment for 3 phase, 25 cycle power, 12,000 to 550 volts; electrically operated air compressor, 500 cu.ft. delivered; electrically driven hoist with motor not less than 50 hp. complete with switching equipment; four 3½ in. sinking drills; one portable saw mill electrically operated; three 1 ton sinking buckets; two 1 ton ore cars, tools, etc.

Que., Yamachiche—Desrobe & Fils, Three Rivers, Que.—machinery for plant manufacturing oil burners.

OPPORTUNITIES FOR FUTURE BUSINESS

Calif., Los Angeles—The Ford Motor Co., East 7th St. and Santa Fe Ave., has awarded the contract for altering its 5 story Class "A" factory building. Estimated cost, $65,000.

Calif., Sacramento—Capitol Co., 625 Market St., San Francisco, has awarded the contract for remodeling and constructing additions to building at 13th and "U" Sts., to be used as shops, parts departments, etc., by Weaver-Rye Tractor Co., 1701 2nd St., Lessee.

Calif., Selma—Selma Union High School Dist. has awarded the contract for the construction of a shop building. Estimated cost, $62,715.

Conn., Bridgeport—Bryant Electric Co., Hemco Division, State St., will soon receive bids for the construction of a 1 story factory on Railroad Ave. for the manufacture of plastic moldings. Estimated cost, $80,000. Fletcher-Thompson, Inc., 1336 Fairfield Ave., Archts.

Conn., Bridgeport—General Electric Co., Boston Ave., W. Stewart Clark, Works Mgr., has awarded the contract for the construction of three factory units. Estimated cost, $55,000.

Ill., North Chicago—Fansteel Metallurgical Corp., 1009 22nd St., plans to extend its plant and install new equipment. Estimated cost, $28,000.

Ind., Columbus—Noblitt-Sparks Industries has acquired the plant formerly occupied by the Lincoln Chair Co. and will alter and equip same for an assembly plant for its own use. Estimated cost, $28,000.

Ind., Terre Haute—Indiana Wood Preserving Co., Terre Haute, plans to repair and alter its plant here. Estimated cost, $35,000.

Ia., Waterloo—John Deere, Waterloo, Ia., manufacturer of tractors, plans to construct an addition to his plant. Estimated cost, $30,000.

Md., Baltimore—Columbia Specialty Co., 1508 Fay St., manufacturer of cans, plans to improve and construct an addition to its plant. Estimated cost, $28,000.

Mich., Dearborn—Ford Motor Co., is receiving bids for construction of continuous glass melting furnace for safety glass factory. Estimated cost, $500,000. This is part of $3,000,000 glass factory enlargement.

Mich., Detroit—Murray Corp. of America, 1424 Aberle St., will construct an addition to plant No. 10. Giffels & Vallet, 1000 Marquette Bldg., Archts.

Mich., Saginaw—Michigan Institute for the Blind has awarded the contract for the construction of a woodworking factory. Estimated cost, $29,076.

N. Y., Brooklyn—Scrap Iron Baling Corp., 435 Morgan Ave., is having plans prepared by Murray Klein, Archt., 65 Court St., for the construction of a 1 story machine shop. Estimated cost including equipment, $28,000.

N. Y., Buffalo—Buffalo Marine Construction Co., foot of Michigan St., A. E. Cornelius in charge, plans to construct an addition to its boat works and dry docks. Estimated cost including equipment, $37,000.

N. Y., Buffalo—Eastman Machine Co., 779 Washington St., will remodel its machine shop. H. E. Plummer & Associates, 755 Main St., Archts.

N. Y., New York—New York State Marine Academy, 80 Center St., plans to construct machine shops and technical building at Fort Schuyler. Estimated cost, $1,750,000.

N. Y., Ossining—Cambridge Instrument Co., Spring St., (surgical and scientific instruments) plans to construct a 3 story addition to its plant. Estimated cost, $28,000.

N. Y., Schenectady—A. Wayne Merriam, Inc., Erie Ave., plans to construct a factory for the manufacture of electrical appliances. Estimated cost, $40,000.

N. Y., Syracuse — Continental Can Co., 1 Pershing Sq., New York, N. Y., plans to construct an addition to its plant here. Estimated cost, $30,000.

O., Cincinnati—Queen City Steel Treating Co., Spring Grove Ave., has awarded the contract for the construction of a 2 story, 120x162 ft. factory.

O., Cleveland—Allied Printing & Binding Machinery Co., 1975 East 65th St., plans the construction of a plant. Estimated cost, $60,000. E. G. Hoefler, 5005 Euclid Ave., Archt.

O., Dover—Tuscan Metals, Inc., has acquired the plant formerly occupied by the American Sheet & Tin Plate Co., and will alter same and install new equipment for its own use. Estimated cost, $28,000.

O., Tallmadge—The United States Stoneware Co., Akron, O., manufacturer of corrosion-proof equipment, is building a machine shop and metal fabrication building at its plant here.

Pa., Corry—Corry School District has awarded the contract for the construction of a vocational school and will soon take bids for woodworking and metal working machinery, auto repair shop equipment, motors, etc.

Tenn., Memphis—Continental Can Co., 1 Pershing Sq., New York, N. Y., plans to construct an addition to its factory here. Estimated cost, $40,000.

Wash., Seattle—Continental Can Co., 1 Pershing Sq., New York, N. Y., plans to construct an addition to its plant here. Estimated cost, $40,000.

W. Va., South Warwood—Continental Can Co., 1 Pershing Sq., New York, N. Y., has awarded the contract for an addition to its plant here. Estimated cost, $50,000.

Wis., Menomonie—Wisconsin Hydro Electric Gas Co. will construct a 2 story shop and service building. Separate contracts have been awarded for the work. Estimated cost including equipment, $28,000.

B. C., Nanaimo—Syndicate, c/o J. Barsby, Mayor, is having plans prepared for the construction of a lumber mill on Assembly Wharf. Estimated cost $200,000.

B. C., Vancouver—Tyree Lumber Mills, Ltd., Clarke Drive, plans to construct a lumber mill and will be in the market for machinery. Estimated cost, $30,000.

Ont., London—Lawson & Jones, 342 Clarence St., are having plans prepared by O. Roy Moore & Co., Archts., 489 Richmond St., for 2 story, 90x100 ft. addition to plant, and will install special printing and lithographing equipment. Estimated cost, $50,000.

Ont., New Toronto—Continental Can Co., 1 Pershing Sq., New York, N. Y., has purchased a site on Birmingham St. and will construct a plant. Estimated cost, $100,000. D. H. MacFarlane, local Mgr.

Ont., St. Catharines—McKinnon Industries, Ltd., Ontario St., H. Carmichael, Pres., is having plans prepared by A. E. Nicholson, Archt., 46 Queen St., for the construction of a 1 story, 322x360 ft. foundry addition.

Ont., Toronto—National Cash Register Co., of Canada, Ltd., 1131 Bloor St., W., is building a factory on Dundas St., W. Estimated cost, $300,000.

Que., Montreal—Phillips Cut Glass, Ltd., 2085 St. Timothy St., R. A. Way, Mgr., is having plans prepared for the construction of a factory.

Que., Montreal—The Steel Co. of Canada, Ltd., Notre Dame St., W., has purchased a site on Tracy St. and will construct a factory.

Que., St. Johns—Schick Dry Shaver, Inc., 644 Atlantic St., Stamford, Conn., has awarded the contract for the construction of a factory here. Estimated cost, $50,000.

Que., Verdun—Canada Flooring Co., Ltd., Moffat Ave., plans to construct an addition to its factory.

American Machinist — REFERENCE BOOK SHEET ©

SINGLE-POINT TOOLS

Nomenclature and glossary of terms for single-point cutting tools for lathes, planers, shapers, boring mills and other machine tools.

These data were approved December, 1935, by Technical Committee No. 19 of the Sectional Committee on Small Tools and Machine Tool Elements, the American Society of Mechanical Engineers.

1. Each *single-point tool* comprises a shank and a point. See Figs. 1 and 2.

(a) The *shank* is that part of the tool on one end of which the point is formed or the tip or bit supported. The shank in turn is supported on the toolpost of the machine. (See American Standard for "Tool Holder Shanks and Toolpost Openings" B5b-1929.)

(b) The *point* is all that part of the tool which is shaped to produce the cutting edges and face.

(c) A relatively small point, as required in boring, is sometimes attached to the shank by a neck. The *neck* is an extension of the shank but of reduced sectional area.

2. Single-point tools may be made up in different ways as follows:

(a) The ground tool in which a point is formed on the end of a bar (shank) of tool steel by grinding, Fig. 1.

(b) The forged tool in which a point is forged roughly to shape on the end of a bar (shank) of tool steel and subsequently ground, Fig. 2.

(c) The *tipped tool* in which a tip of tool material, such as high-speed steel, super-high-speed steel, Stellite, cemented carbide, or diamond, is welded or brazed to the end of a bar (shank) of steel. It is then ground to required shape to form the cutting edge and face of the tool.

(d) *Bit tools* in which bits of the tool material, of square, rectangular, or other section, or forged to special shapes, are held in the end of a holder or shank, Fig. 4.

3. (a) *A right-hand single-point tool.* In looking at the point end of the tool with face upward and the shank pointing away, the cutting edge of a right-hand tool is on the right side, Fig. 1.

When used in an engine lathe, the cutting edge is on the left side and it is to be fed into the work to the left, as when cutting a right-hand screw thread.

(b) A left-hand tool has the cutting edge on the left when looking at the point end with the face upward as stated under (a). For recommended tool symbols, see Part 12.

4. A single-point tool may be straight, right or left bent, or right or left offset as follows:

(a) *A straight-shank tool* has the point on the forward end of a straight shank, Fig. 1.

(b) *A bent-shank tool* has the point bent to the right or left, Fig. 5, to make its operation more convenient. These tools are called right-bent-shank tools if the point is bent to the right when looking at the tool from the point end with the face upward and the shank pointing away.

(c) An *offset tool* has the point offset to facilitate the operation, Fig. 6. It is known as a right-offset tool if the point is offset to the right of the shank when looking at the tool from the point end with the face upward and the shank pointing away. For recommended tool symbols, see Part 12.

5. Each single-point tool consists of various parts as illustrated in Figs. 1, 2 and 3 as follows:

(a) The base is that side of the shank which bears against the support taking the tangential pressure of the cut.

(b) The *face* is that surface on which the chip impinges as it is cut from the work.

(c) The *heel* is the forward end of the base immediately below and supporting the face.

(d) The *cutting edge* or lip is that portion of the face edge intended to make contact with the material being cut. The cutting edge consists usually of the side-cutting edge, the nose radius, and the end-cutting edge, Fig. 1.

(e) A *curved cutting edge tool*, as shown in Fig. 2, has variable side-cutting-edge angles.

(f) The *nose* is the curve formed by joining the side- and end-cutting edges.

(g) The *profile* is a plan view when looking at the face from a point at right angles to the base. It is formed by joining the side- and end-cutting edges with the nose.

(h) The *flank* of the tool is the surface below the cutting edge.

(i) *Raised face.* The face of a tool may be above or below the top of the shank. Forged tools, as in Fig. 2, usually have the face raised above the shank top so that

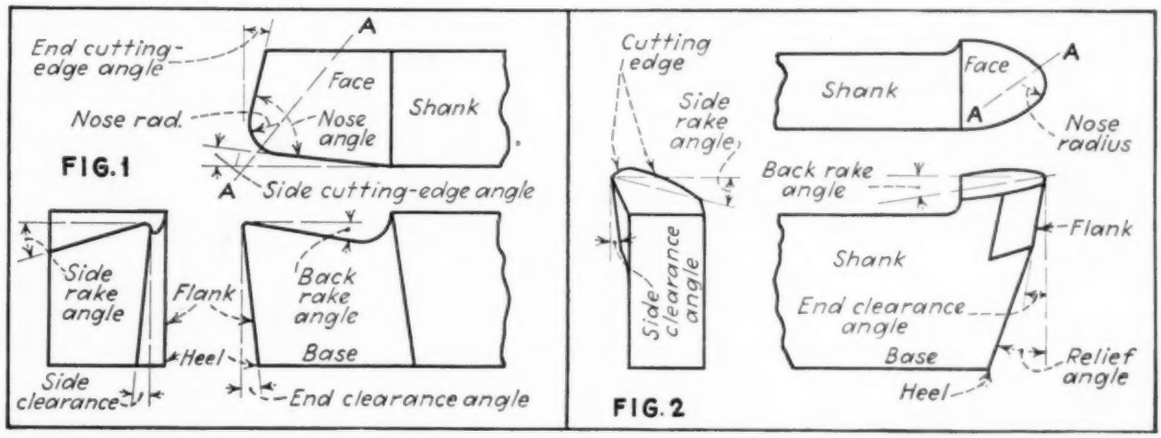


Fig. 1—A right-hand-cutting, straight-shank, single-point tool with a straight cutting edge, as ground on a bar of tool steel. The names of parts and angles are indicated. Symbol: RH. Fig. 2—A right-hand-cutting, straight-shank, single-point tool with a raised face and curved cutting edge, as forged and ground on a bar of tool steel. The names of parts and angles are indicated. Symbol: RH.

SINGLE-POINT TOOLS

less material need be removed in regrinding the point. The details of forged tools should be shown by drawings.

6. Each tool is provided with *various angles*, as shown in Figs. 1, 2 and 3, to facilitate its operation, as follows:

(a) *Back-rake angle* is the angle that the face slopes toward the shank of the tool.

(b) *Side-rake angle* is the angle that the face slopes to the side at right angles to the axis of the shank.

(c) *True rake angle* (or "top" rake), under actual cutting conditions, Fig. 3, is the actual slope of the tool face from the active cutting edge in the direction of chip flow. It is a combination of the front- and side-rake angles and varies with the setting of the tool and with the feed and depth of cut.

(d) *Clearance angle* is the angle at the cutting edge between the ground portion of the flank and the machined surface.

1. *Side clearance* is the angle at the cutting edge between the flank under the side-cutting edge and the machined surface.

2. *End clearance* is the angle at the cutting edge between the flank at the end and the machined surface.

(e) *Lip angle* is the included angle of the tool material between the face and ground flank measured in a plane at right angles to the active cutting edge.

(f) *Cutting angle* is equal to the lip angle plus the clearance angle at the point.

(g) *Relief angle* is the angle of the surface below the ground flank, Fig. 2, which usually is forged or rough ground before hardening so as to reduce the amount of grinding on the flank. The flank sometimes extends to the heel, Fig. 1, in which case there is no relief.

(h) *Side-cutting-edge angle*, Fig. 1, is the angle between the straight cutting edge and the side of the tool shank.

(i) *End-cutting-edge angle* is the angle between the cutting edge on the end of the tool and a line at right angles to the side edge of the tool shank. See Fig. 1. As the setting angle is changed, the relation of the end-cutting edge to the work also is changed.

(j) *Setting angle* is the angle between the cutting edge and the surface being cut. There are side- and end-setting angles. They are varied by swiveling the tool shank in the machine.

(k) *Nose angle* is the angle included between the side cutting-edge and end cutting-edge.

7. The *cutting speed* is the peripheral or surface speed of the work with respect to the tool, in turning, it is usually measured on the uncut surface of the work ahead of the tool.

Example: Approximate cutting speed S
in turning in f.p.m. $= 3.1416$
in turning in r.p.m. $= 3.1416$
DN, in which
D = diameter of work in feet
and N = revolutions per minute of work.

8. The *depth of cut* is the distance that the nose of the tool is buried into the work as measured from the uncut surface ahead of the tool. It equals the thickness of the material being removed by the tool from the work surface to obtain the machined surface, Fig. 5. In turning it is equal to one-half the difference between the original and final diameters, Fig. 3.

9. The *feed* is the relative amount of motion of the tool into the work for each revolution or stroke.

10. The *machined* surface refers to the surface left by the cutting tool, Fig. 3.

11. The *work surface* refers to the surface to be machined.

12. A recommended system of symbols for brevity in catalogs and purchase orders:

RR or RH (SS)—Right-hand-cutting, single-point tool, with straight shank, Fig. 1.
LH or LH (SS)—Left-hand-cutting, single-point tool, with straight shank.
RH (RB)—Right-hand-cutting, single-point tool, with right-bent shank, Fig. 5, right.
RH (LB)—Right-hand-cutting, single-point tool, with left-bent shank, Fig. 5, left.
LH (RB)—Left-hand-cutting, single-point tool, with right-bent shank.
LH (LB)—Left-hand-cutting, single-point tool, with left-bent shank.
RH (RO)—Right-hand-cutting, single-point tool, with right-offset shank, Fig. 6.
RH (LO)—Right-hand cutting, single-point tool, with left-offset shank.
LH (RO)—Left-hand-cutting, single-point tool, with right-offset shank.
LH (LO)—Left-hand-cutting, single-point tool with left-offset shank.

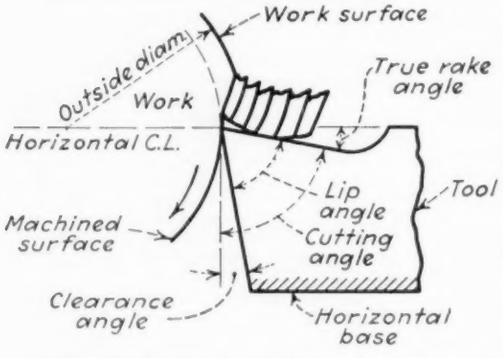


Fig. 3—A section through the plane of the chip flow indicated as A-A in Figs. 1 and 2.

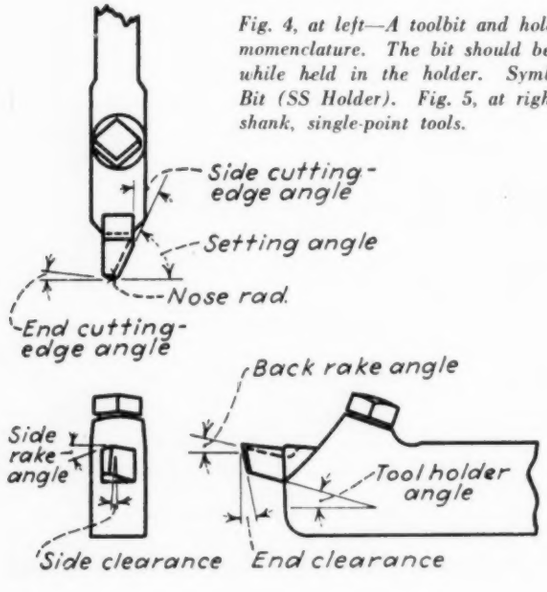
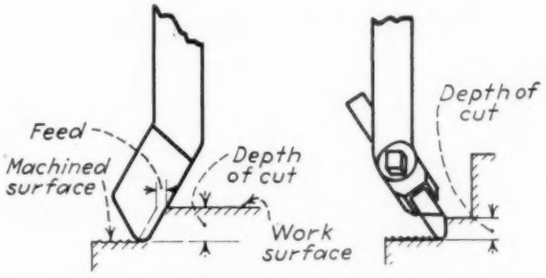


Fig. 4, at left—A toolbit and holder with momenclature. The bit should be ground while held in the holder. Symbol: RH Bit (SS Holder). Fig. 5, at right—Bent-shank, single-point tools.



Right-hand-cutting, left-bent-shank tool. Symbol: RH (LB)

Right-hand-cutting tool bit in a right-bent-shank holder. Symbol: RH (RB)

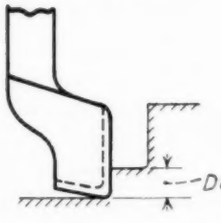


Fig. 6—Right-hand-cutting, right-offset, single-point tool. Symbol: RH (RO).

The Round Table

BLACK LIST

"I hear you had a rumpus at the Board of Trade dinner the other night, Al. I'd probably have called it a 'row' but rumpus sounds a bit more dignified for the head of a compressor company."

"Call it what you like, Ed—row or rumpus suits me. But I guess I made myself unpopular with some of the big boys in town all right."

"Something as to hiring men away from each other I heard, Al. Just what was it all about anyhow?'

"Old Bill Bowers of the loom works said that, as business was picking up, we'd better remember the old agreement the shops had about hiring each others' men. So I pretended not to know anything about it, just to let him put himself on record."

"Well, what did he say?"

"Oh, he sort of condescendingly said that as I was a newcomer in the manufacturing field I probably didn't realize how it made things hard for everyone to have men drifting from one shop to another—was bad for the men and bad for business. If one shop got a big order it might be tempted to offer more than the going rate and so make men dissatisfied. Or if I had a particularly good man I wouldn't want another shop to get him away at a little higher pay."

"Well, what's wrong with that, Al? I call it mighty thoughtful of old Bill."

"Thoughtful, my eye, Ed. Bill was afraid I might offer some of his men more money and get them. And he pays just as little as he dares. I'm against the whole scheme."

"Sounds as though you wanted to pay higher wages. Aren't our costs high enough now?"

"And you sound like a bloated bondholder, Ed. Of course we want to keep costs down. But you ought to know that good men are cheaper at a high rate than poor ones at less money. It's our privilege to decide what a man is worth to us. If he happens to be working for Bill Bowers and we offer him more money, it's just too bad for Bill, if he'd rather come to us."

"You'll be darned unpopular in town if you act that way, Al."

"What about you, Ed? If Bill thought you were worth more money than Williams will or can pay you, would you like to know that you couldn't get away because Williams saw you first?"

"No, of course not. But—"

"But nothing, Ed. It's the principle of the thing that riles me. We talk about a man being worthy of his hire, and then Bill wants us to agree not to hire him unless he wants to let him go. Too much like buying and selling ball players. I don't like it—and said so."

"The old gang will sure love you, Al. They'll be after your scalp from now on."

"Let 'em come, Ed. I don't join any black list scheme that prevents a good mechanic getting what he's worth. They are too darned scarce as it is."

Is Al's stand best for his company and his men? Should he consider its effect on other firms or on the community?

DISCUSSION

Concrete Floors

The heated concrete floor undoubtedly has many advantages over a floor that is not heated; but there are so many objections to concrete floor that it will never be considered equal to a wooden one.

It is hard to keep a concrete floor clean from oil and grease, and with the heat coming through the floor it will carry with it odors and fumes that will be objectionable. There are days when it would not be necessary to heat the shop with a wooden floor; but to be comfortable on a concrete floor, you will have to heat it.

Concrete floors are hard on the shoes. By actual experience it has been found that a pair of shoes will be worn out after one month service on a concrete floor, while on a wooden floor under the same circumstances they will last from six to nine months.

Most men will object to working on a concrete floor whether it is heated or not. They don't always know the reason for it, so they say, that it is too hard to stand on. The answer perhaps is that we have all been used to wooden floors, and it is naturally hard to change.

—Nils H. Lou,
Toolroom Foreman,
Glenn L. Martin Company.

Open House

Small tools are items that figure very prominently in overhead in certain types of industries. While most small tools are comparatively inexpensive, they are not given the careful handling and attention that other and more expensive tools are. But small tools may easily become very important factors in cost if each workman is permitted to go to the toolcrib and take the ones he needs and return them at his convenience.

The care of tools by the workman and their place in the toolcrib is secondary to his job, which is production. Consequently, when putting a tool back in the toolcrib he is apt to toss it on the handiest shelf when he is in a hurry, and the next man who comes after that same tool will not find it in its proper place. It seems to me that operating a toolcrib without an attendant is a slack way to run such an important department in a plant.

If I were running a business, I would want an attendant in the toolcrib as an assurance that each tool was either in its place or was accounted for by a tool check. —MAURICE H. BAITLER, *Perkins Machine & Gear Company.*

Purchased Parts

Al would be very wise to farm out some of his surplus work. While it is the duty of a shop executive to strive to enlarge his plant, it should be done gradually, for it certainly would not pay to install new equipment for business that is visible for only a short time.

Perhaps the reason that Ed is so worried about the accuracy of work that is farmed out is because the various features of the work are kept in the heads of a few men. This trouble can easily be corrected by one or two trained engineers and draftsmen.

A clear set of drawings with sensible limits and comprehensive notes in regard to finishes can be understood by most mechanics in any shop. So any shop that is equipped for Al's particular kind of work will be able to find men that are trained, or can train men under proper supervision for the work Al has to have done outside.

—EDWARD HELLER.

Al should first decide whether the present rush is a spurt that may be of short duration, or whether it is the result of a steady growth based on a deserved increase of buyer confidence. If he continues to receive orders from his original customers along with orders from new customers, his confidence in the future of his company is justified. He should then expand the plant, using plenty of judgment as to a factor of safety, always making the business force the growth.

During the expansion period it will, of course, be necessary to farm out some of the work in order to make deliveries on time. Parts that require additional special equipment should be the first to be farmed out. Parts that are simple in design and are susceptible to complete specifications that leave no doubt for different interpretation by either the buyer or the supplier should be the second choice for farming out. Farming out parts should be continued until such time as the business reaches the point where the investment in additional equipment will show a definite saving in production costs without any impairment in the quality of the product.

—C. A. JOHNSON.

It is sometimes more profitable to farm out a certain amount of work than to install more equipment, particularly where an outside concern is equipped to handle such work by automatic machines.

While Al, like most small shop owners, is suspicious of the other fellow's quality of workmanship, he has the safeguard in his own hands. It is a simple matter to have the outside shop agree to specified limits of accuracy, and in nine cases out of ten the agreement will be fulfilled.

In the last analysis, in these days when the business barometer tends to fluctuate, the small shop owner can't afford to be left high and dry with extra overhead in the shape of idle space and equipment by a sudden recession of business. So Al, farm out some of the work in the meantime and, as confidence grows with the upswing of business, plan for gradual expansion.

—ROBERT S. ALEXANDER.

What About Vacations?

In England, deciding when each member of the staff shall take his vacation is simplified by the now almost general practice of plants closing the first week in August, which is also an authorized bank holiday. Except for higher executives, all the staff entitled to two week's vacation must take this week together with either the preceding or the following week.

From the employers' point of view this is more satisfactory than having members of the staff away at dates varying from May to September, with difficulties arising as to how their duties are to be carried out efficiently during their absence. Employees, on the other hand, do not always find that this arrangement is equally satisfactory. In most cases they would prefer to fix a date other than the one they are compelled to accept.

The practice of granting vacations with pay to industrial workers is showing signs of gradual extension. The concession is much appreciated by men who have never known a holiday without a short pay envelope.

—W. L. WATERHOUSE, *Bristol, England.*

Yearly Wage

A yearly wage would work satisfactorily in but few cases. Manufacturers seldom have a steady flow of work the year round. Nearly all contracts last for weeks, or at most months, and the rate at which they are received is variable. In trades where the work is of a seasonable nature, a yearly wage would be almost impossible. The majority of men in the shops must of necessity be employed on an hourly or weekly basis, although some men have worked for years for one concern without losing time or being laid off.

When times are slack a yearly wage would probably cause so severe a strain on the employer that he would be unable to continue it. When times are prosperous a good workman can always get work, but when times are slack no employer can pay a man for doing nothing. —W. E. WARNER, *Bromley Common, Kent, England.*

A New Line

To enter a new and unfamiliar market with a product that is no better than those existing, but which can be sold at a cheaper price, may easily lead to failure. The established manufacturer will probably sell at such a margin of profit that he can reduce prices sufficiently to freeze out the newcomer. However, if the newcomer's product is covered by a really watertight patent, and if he has sufficient capital to defend his patent, he is well equipped to break into a new market if his product is superior to or cheaper than those for sale. But it must be remembered that it is impossible to make a profit without incurring some costs and running some risks.

Many large concerns have diversified products and their sales organizations are divided into groups, each group pushing the sales of one class of product. —ROBERT HUTCHESON. *Kenton, Middlesex, England.*

Ideas FROM PRACTICAL MEN

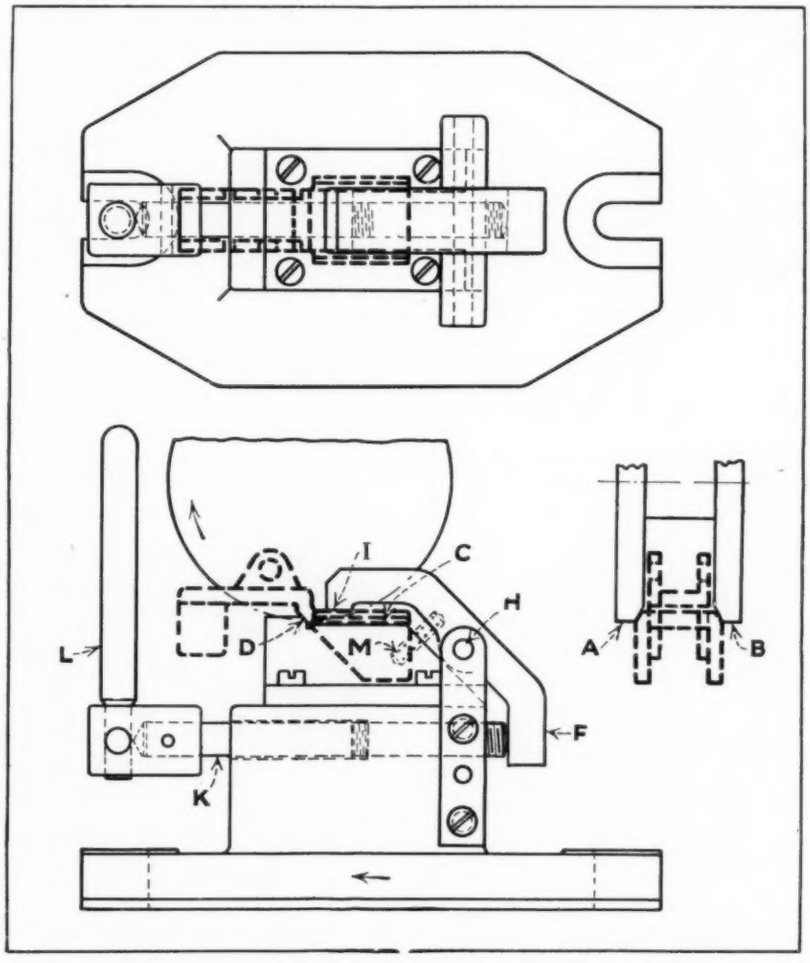
Straddle Milling Fixture

F. SCRIBER

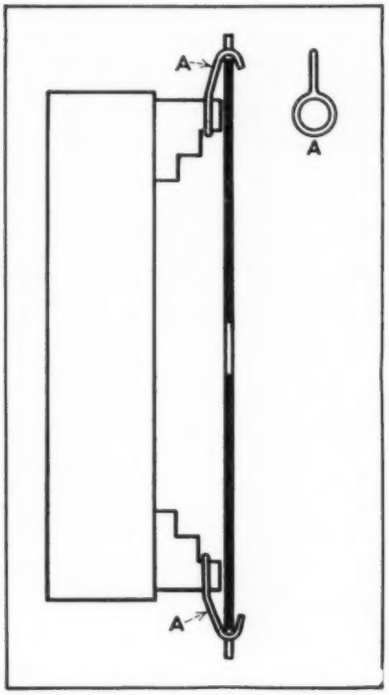
A fixture for straddle milling is shown. The work, indicated by heavy dotted lines, has a small bevel milled on each side for part of its length by the straddle mills *A* and *B* and is fed from right to left, the cutters revolving in the direction indicated by the arrow.

In loading the fixture, the work is slid from the left over the holding block *C* and is located by the beveled stop at *D*. The clamp *F*, pivoted at *H*, clamps the work at *I* and is narrow enough to go between the straddle mills without interference. It is operated by the screw *K* through the lever *L*. In unloading, when the clamping screw is backed off, spring *M* releases the clamp sufficiently to permit the work to be raised clear of the beveled stop *D* and to be withdrawn by sliding it to the left from the holding block.

As constructed, the fixture allows the straddle mills to pass over the work without interference and permits the lever that operates the clamping screw to be conveniently located.



A pivoted clamp narrow enough to go between the straddle mills without interference is employed, and is raised clear of the work by a spring when the clamping screw is backed off



The saws were held by hooks having eyes at one end. The eyes were slipped over the chuck jaws and the hooks gripped between the teeth

Holding Work Too Large for the Lathe Chuck

H. M. JAMES
James Machine Works

A customer brought into our shop several circular saws to have the central holes bored to suit mandrels of larger diameter.

The jaws of our largest chuck could not be opened far enough to hold the saws. The situation was overcome by making four steel hooks of ½-in. round stock and having eyes at the ends, as at *A*. The eyes were slipped over the chuck jaws, as shown in the illustration, and the hooks gripped the saws between the teeth. The saws were trued by manipulating the chuck jaws in the usual way.

Spring Tools

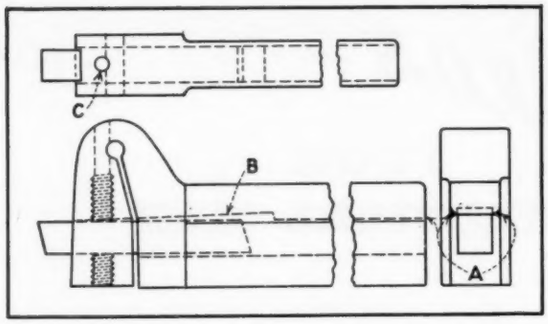
WILLIAM S. ROWELL

Referring to the article by Charles Weslow under the title "Another Job Shop" (*AM*—Vol. 79, page 766), thanks are due the author for calling his tool by its appropriate name in-

stead of calling it a gooseneck tool, as is often done.

In the illustration is shown a spring toolholder of a later date that seems to me to leave little to be desired. It is made in two parts to avoid having to broach the square hole for the toolbit, and the channel in the lower part is carried the whole length because it is easier to make so, and because one sometimes needs a knockout hole. The upper part of the holder is spring steel and should be given a spring temper. The lower part is carbon tool steel, the two parts being welded together, as at *A*. The upper part is relieved at *B* to permit the back end of the toolbit to rise as the point springs down under increasing pressure of the cut.

The hole for the safety clamping screw is drilled and tapped from the bottom to avoid cutting away too much metal at the point of flexure. The hole *C* is just large enough for the key wrench for the safety clamping screw. Such a toolholder not only has its point of flexure as nearly as is possible above the cutting edge of the toolbit, but permits the use of regular toolbits instead of having to solder the tools to the holder, as described by Mr. Weslow.



The holder is made in two parts to avoid broaching the square hole for the toolbit. The upper part is spring steel and is welded to the lower part

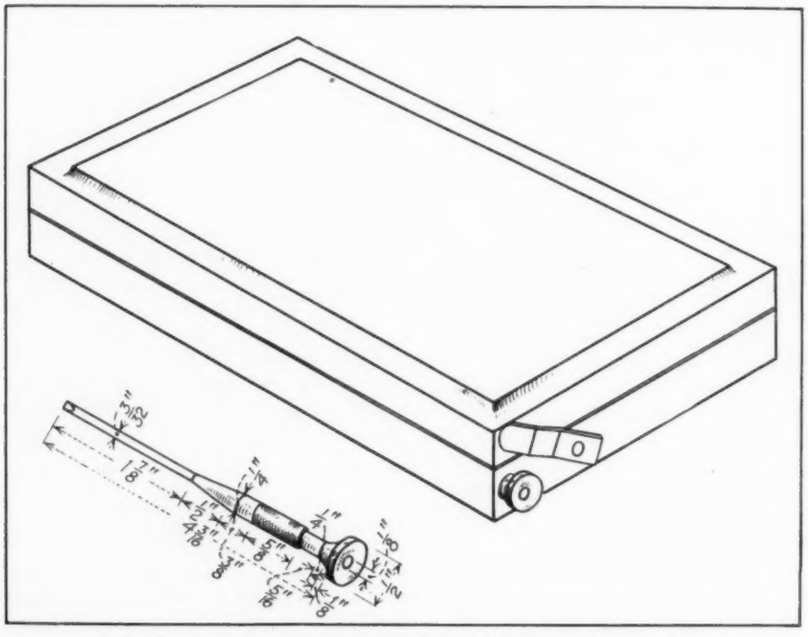
A Screwdriver When Needed

C. F. FITZ

How often, when we use a small screwplate set and wish to tighten the die in the stock, or wish to adjust the screw in the die to change the size of the thread, do we have a screwdriver at hand that fits the screws accurately? The result is broken screws, slots chewed out of screws, broken dies, and numerous other things happen to the die or the stock, because a screwdriver of the proper size is not at hand and anything is used in its place.

To overcome these difficulties and always have a screwdriver of the proper size at hand, this screwdriver holder was made. The drawing shows a simple screwdriver that meets the above needs very well. The screwplate box has a hole drilled in the end to take care of the screwdriver so that it will enter up to the head, a piece of spring steel is bent as shown and fastened to the wooden screwplate box with a round-head wood screw.

When the screwdriver is placed in the hole in the box this spring is pushed down over the end, thus keeping it in place. In order to remove the screwdriver from its hole, the spring is pushed up. This arrangement has saved more than the price of making ten screwdrivers in the saving of time in setting and adjusting the screwplates in our shop in the space of two weeks.



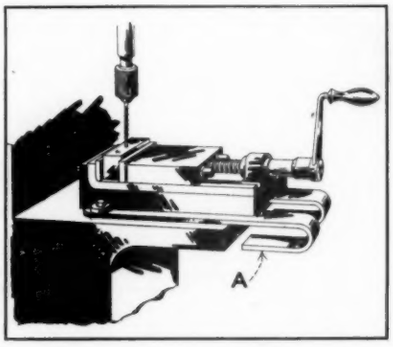
A holder in the screwplate box keeps the right size of screwdriver conveniently at hand

Machine Vise Hold Down

H. MOORE
Hamilton, Ontario, Canada

One of the inconveniences connected with using a machine vise on a multiple-spindle drill press is the way it lifts up from the table when pressure is applied to the handle to tighten or loosen the work. The vise cannot be clamped down in the usual way because it must be free to slide along the table from one spindle to the other.

To overcome the trouble, I recently made the strap *A* and attached it to the vise. While it does not prevent the vise from being slid along the table, it holds the vise down while the work is being tightened or loosened. The strap is bent as shown and is held to the bottom of the vise by screws through the lugs or ears. After bending the strap, a light skimming cut is taken over the sides to make it lie flat.



By pushing the vise inward the strap locks it to the table and prevents it from lifting when the work is being tightened or loosened

With the strap in place and the work under the drill, the vise is free to slide

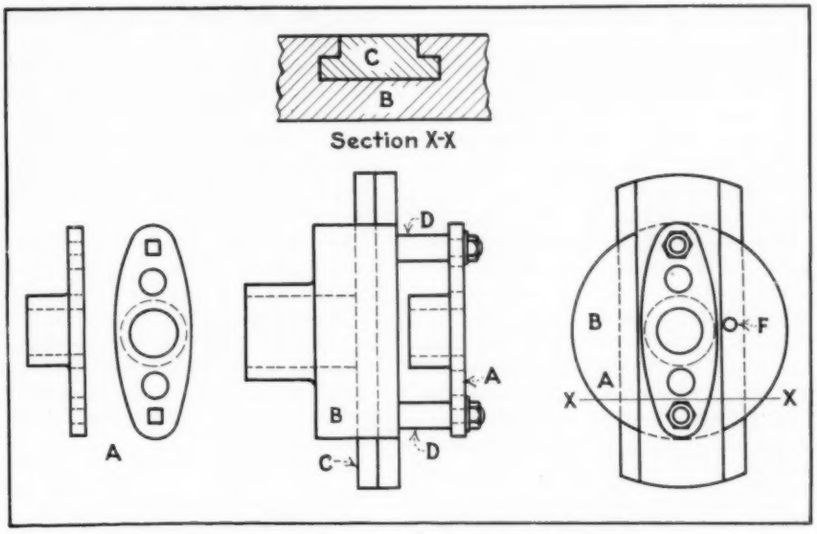
along the table, but when the work is to be tightened or loosened the vise is pushed inward until the bent end of the strap engages the under part of the table and prevents it from rising.

A Boring Fixture for the Lathe

TOM KANIPE

In repairing our looms we have had considerable trouble in making new rocker shaft bearings, one of which is shown at *A* in the illustration. Three holes are bored in each bearing, one through the boss in the center and one on each side of it and equidistant from it. All three holes must be in line and correctly spaced. The square holes in the ends of the bearing are cored for square shank bolts for attaching it to the frame of the loom.

To space the holes correctly and get them in line, we made the fixture *B* to screw on the lathe spindle. A T-slot is milled across the center of the face and the slide *C* is fitted to it. The work is mounted on the slide by two shouldered studs, as at *D*, the threaded outer ends passing through the square holes in the ends of the work. The slide is positioned for boring the holes by the pin *F* passing through holes in it and into holes in the body of the fixture.



The work is mounted on the slide by two shouldered studs and is positioned for the holes by a pin passing through holes in the slide and into holes in the body of the fixture

Long Reach Calipers

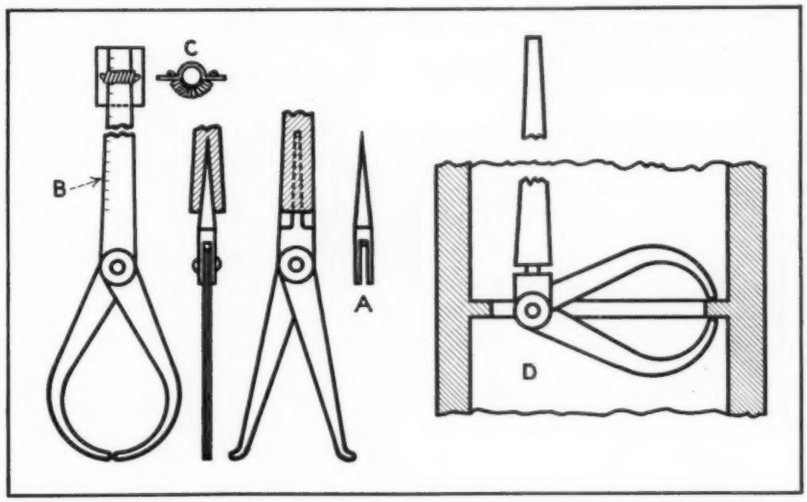
ARTHUR MUNCH

Some years ago I converted two pairs of my smallest calipers into long reach calipers, as shown in the illustration.

The washers were removed and the yoke *A* was riveted on in their place, being left loose enough to swivel at the joint. The yoke terminated in a tang and the long, graduated stem or handle was driven on it. This handle served two purposes: one for reaching into small deep holes, and the other as depth gage by putting on the spring slide *C*.

The inside calipers were convenient for calipering small deep holes at any part of their depth. By swiveling the outside calipers at a right angle to the handle, as at *D*, it was possible to caliper the thickness of an annular ring that was below the surface of the work, and that could not otherwise be reached.

At the time I put these handles on my calipers I was working in a railroad shop and had to get the calipers into all sorts of otherwise inaccessible places.



The handle made it possible to use the calipers in all sorts of otherwise inaccessible places. Being graduated it can also be used as a depth gage

Gage for Setting Lathe Tools

GEORGE J. MURDOCK

"But why go to the expense of such a device?", asks J. T. Towlson (*AM*—Vol. 79 page 501) and offers a substitute that of itself would be of comparatively small cost.

For a one-lathe shop, always doing work between centers, the plan shown is as feasible as to set the tool point to the lathe center, a method used by many in the past and one that is still less costly. In larger shops, however, with lathes of many different makes and modern build, having hardened tailstock spindles, drawing the line on the spindle would be impracticable.

Then, too, not all lathes have an overhang on the front of the tailstock but are made straight up from the shears. To draw the three lines described would not be difficult, but to set the tool to any one of these lines would involve swinging the holder around parallel with the spindle sufficiently to overhang and reach the lines; after being set, before the work could be started, it would have to be turned back at right angles which would lose the setting.

Admitting that the lines could be drawn as described and assuming that a shaft, say 8 ft. long and 3 in. in diameter, were to be turned with the tool set to one of these lines, and that after the cut had been taken for 7 ft.

it was found necessary to grind the tool.

It may be thought that the bit could be removed from the holder, sharpened and then returned to the exact position from which it had been removed, but it must be remembered that with a heavy cut there is a powerful downthrust that has been taken up by the springing of the holder, the toolpost and all parts beneath down to the shears. One trial of this method will convince the operator that the cutting point must be set under the same conditions as at first, that is, to the lines on the tailstock or spindle. While this involves moving the heavy carriage back to the tailstock, and after the tool has been set, returning it 7 ft. again to the proper position to resume the cut, 14 ft. of time consuming work to accomplish the simple setting of the tool bit. With the gage I have shown only a fraction of that time is necessary.

Furthermore, center work, such as turning a shaft, is only one of the many jobs required on a lathe, and in most shops, one man cannot always work on the same lathe for various reasons.

It would also be interesting to know how he would set up a tool for faceplate work, boring on the faceplate or chuck or for internal thread cutting, especially when it is necessary to have the tool exactly on the center to avoid distortion of the angle.

Any tool may be set up for the various kinds of work above mentioned with the gage I have described by simply placing the angular opening on the gage against a center either in the head, or tailstock spindle in a way so quick and simple as to seem to need no explanation to the average lathe operator.

Of the common steel rule method mentioned, little can be said. Of course the "be gess and be gad" way that has so long been popular we still have with us as well as the spring caliper. Yet in these high pressure times, when in this country at least every effort is demanded to lower costs, the small initial cost of any tool that can be of assistance should not militate against it.

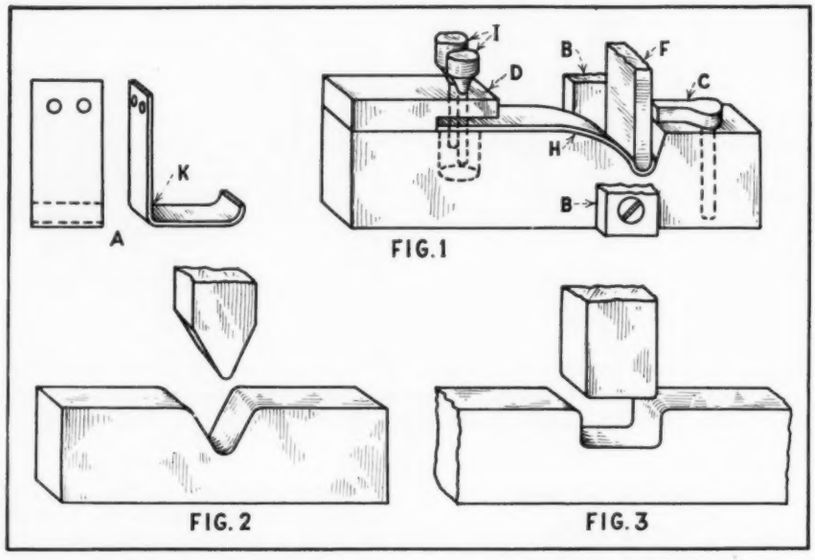


FIG. 1

FIG. 2

FIG. 3

The bends are made in two operations because they must be bent more sharply than a right angle to compensate for the initial spring of the stock

Press Tools for Bending Spring Steel

CHARLES WESLOW

We had to make a quantity of springs such as the one shown at *A*, Fig. 1, from 0.045 in. clock springs.

The blanks were cut to length and nested in position in the die in Fig. 1 by the side gages *B*, the pin *C* and the stripper *D*, the die being the same width as that of the blanks. In operation, the two holes at one end are pierced first, and as the ram continues its descent, the bending punch *F* carries the opposite end down over the long curve *H* in the die and finally makes the short bend at the end. The piercing punches *I* hold the blank and prevent it from slipping during the bending operation. As the ram ascends, the long curve in the body of the blank straightens out, due to the initial spring of the stock.

For making the right-angle bend *K*, such tools as are illustrated in principle in Fig. 2 are used. The included angles of the punch and the notch in the die are less than 90 deg., so as to allow for the springback of the stock. It would not be possible to make the bends in one operation in such tools as are shown in Fig. 3 because the stock must be bent to an angle sharper than 90 deg. to allow for its initial spring.

Templet for Checking Tapped Holes

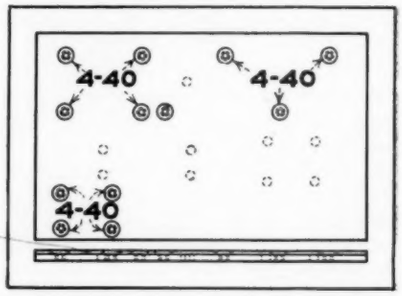
IRA S. WILLIAMS

In the manufacture of radio receivers and other products having panels and chassis, the omission of tapping one or more holes often causes costly delays in the assembly line. And often such holes are in almost inaccessible places, making hand tapping difficult if not impossible. It is generally the practice to furnish inspectors with a checking templet containing all the holes in a panel or chassis, both tapped and plain. However, such a templet does not provide means for isolating the tapped holes from the plain ones.

Where there are a great many holes in a panel, some of which are tapped, much time can be saved by using a sighting templet for the tapped holes, as illustrated. Such a templet contains a sight hole for each tapped hole and the sizes and pitches of the taps to be used are stamped near the holes in figures large enough to be readily distinguishable.

In use, the templet is placed on the work and shows the operator the holes that are to be tapped and the sizes and pitches of the taps to be used. It can also be used by the inspector to show if all necessary holes have been tapped.

Of course, the templet for checking all holes and their locations should not be dispensed with.



This templet is placed on the work to be tapped, as a guide for the operator. It has a sighting hole for each hole to be tapped

Flexible Couplings for Light Shafting

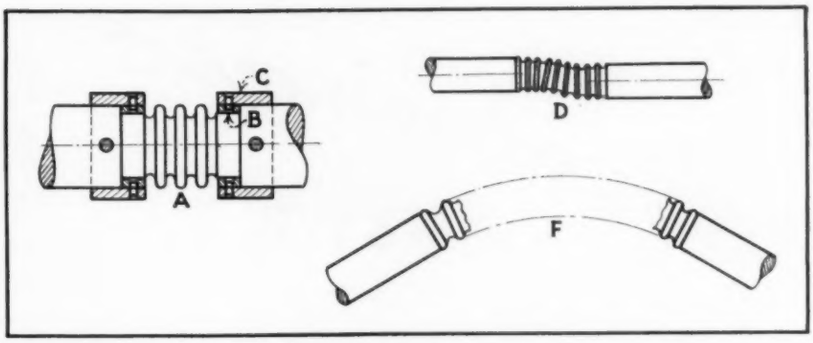
JOHN A. HONEGGER

It was necessary that some mobile calculating machines be connected to fairly long line shafts by a flexible means. The shafts were collared in bearings on aluminum plates and, since the plates were several feet in length, it was necessary to provide some coupling device that would allow for expansion and contraction of the plates and yet prevent any change in orientation between the shafts. Another factor that had to be considered was the possibility of misalignment of the shafts.

A coupling of the sylphon bellows type, as shown at *A*, was decided upon as one that would give the best service. It is a phosphor-bronze corrugated bellows of the type generally used for operating thermostatic valves, but of smaller size. The coupling is fastened between the inner and outer rings *B* and *C* by rivets.

At *D* is shown an exaggerated case of misalignment of shafts that is compensated for by couplings of this type. While both shafts will revolve in unison, the corrugations of the couplings will wabble back and forth at a right angle to the axis of rotation. If the misalignment is such that the corrugation wabble is less than their pitch, interference will not occur.

It is possible for the shafts to be at as great an angle as at *F* and to revolve in unison. The greatest strength of a coupling of this type is in its torsional direction, while its greatest flexibility is in a direction at a right angle to its rotation.



Flexible couplings of the sylphon bellows type will compensate for misalignment within wide limits

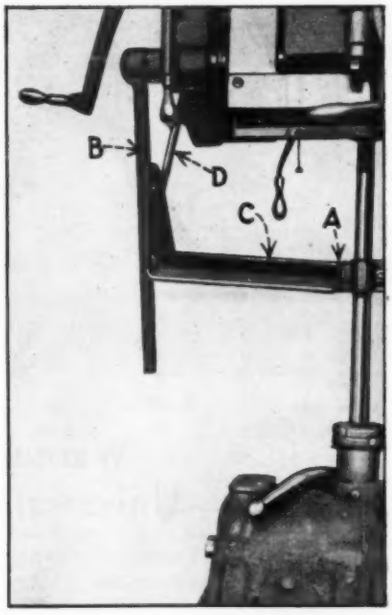
Reducing the Feed of a Boring Mill

CHARLES C. TOMNEY
Chief Tool Designer
Carrier Engineering Corporation

In grooving our flywheels with a multiple tool, the finest feed of the boring mill was too coarse to feed the tool automatically without danger of spoiling the work.

To reduce the feed, we bolted the two-lobed cam *A* on the vertical feed shaft and put the ratchet wrench *B* having the right-angle extension arm *C* on the squared end of the cross-feed screw, in place of the regular crank. The extension spring *D* was attached to *C* to keep it in contact with the lobes of the cam. The lobes of the cam may be made longer or shorter so that the ratchet wrench will be moved the necessary number of notches.

The speed of the cam can be further varied by changing the speed of the vertical feed shaft by means of the feed-changing lever on the gearbox. For turning and facing, unhook the spring, remove the ratchet wrench and proceed in the regular way.



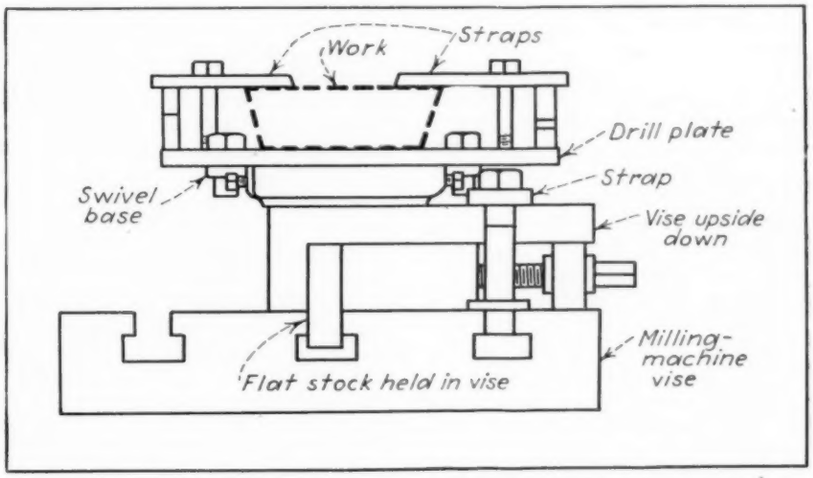
The feed was reduced by putting a ratchet wrench having a right-angle extension on the feed screw, the wrench being operated by a two-lobed cam on the vertical feed shaft

Bottom Side Up

FRANK MOORE

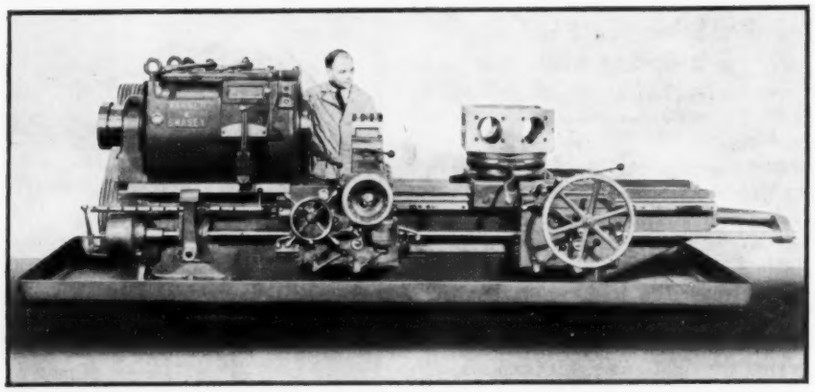
I had to make a couple of angular cuts across some blocks with tapered edges, and I wanted to use the swivel base vise to take advantage of the graduations for setting the work at an angle. The tapered edges prevented me from using the vise in the ordinary way, but upon reflection I decided to use it upside down.

First, I gripped a piece of stock in the vise that fitted the small width of the T-slot; this locked the vise in one position, and I strapped it down with a strap on both sides. Next I bolted a plate, borrowed from a drill press, furnished with numerous clamping holes, to the swivel base of the vise. On top of this I placed the work, strapped down in the ordinary way. In this way I made use of the vise as a protractor for setting the job to take angular cuts.



When the swivel vise could not be used right side up it was inverted

Shop Equipment NEWS



Warner & Swasey Universal Turret Lathe

Increased output with lessened physical effort is the aim of the 4-A universal turret lathe announced by the Warner & Swasey Co., Cleveland, Ohio. This machine is offered in 8- and 9-in. spindle capacities, and 28¼-in. swing. All shafts of the head are mounted one above the other to the rear of the spindle, thus placing the gear train entirely to the rear. This construction promotes rigidity and permits a larger spindle.

A new cross-slide and square turret offer rigidity featured by a square lock gib. This is used for the first time in combination with the conventional dovetail on the opposite side of the cross-slide, and offers new capacity for absorbing the strains in overhanging tools. Hard steel replaceable wear strips have also been added to the seat of the cross-slide to preserve the initial accuracy.

The square turret of this machine has an internal circumferential clamp ring which eliminates the tendency at this point for looseness due to excessive wear. Indexing clamp handle for this turret is located in front, where it overcomes interference with the hexagon turret tools when indexing. This construction permits indexing in tight positions. Conventional rockers are replaced by shims to elevate the cutting tool to the correct height.

Both hexagon turret slide and square turret carriage are equipped with an oil reservoir and a Bijur pump. The pump is actuated by the travel of the slide in each case and automatically lubricates the ways whenever the slide moves. The oil reservoir, being a glass chamber and entirely separate from the apron mechanism, is completely sealed against coolant.

A direct-reading indicator is provided in the head gear shift which affords increased ease of operation and enables the operator to pick the desired spindle speed without referring to diagrams or charts.

Rapid traverse is offered as optional equipment for the cross-slide. It is provided through an electric unit mounted in front of the hand wheel and equipped with a built-in switch. Large contacts permit quick and effortless control of the cross-slide in either direction.

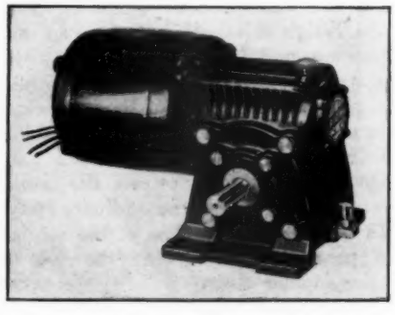
The independent leadscrew is an important feature for threading operations. A solid leadscrew is provided which is independent in its function from the feed shaft. This screw is used for threading purposes only, while all feed and rapid traverse functions operate through the usual rack and pinion. Pick-off gears are provided which are changed to provide whatever pitch of thread is to be cut. A feature of this unit is a quick return of the carriage at a constant speed of 5 ft. per min. This is independent of spindle speed and is accomplished through a convenient lever on the apron, without reversing or stopping the spindle.

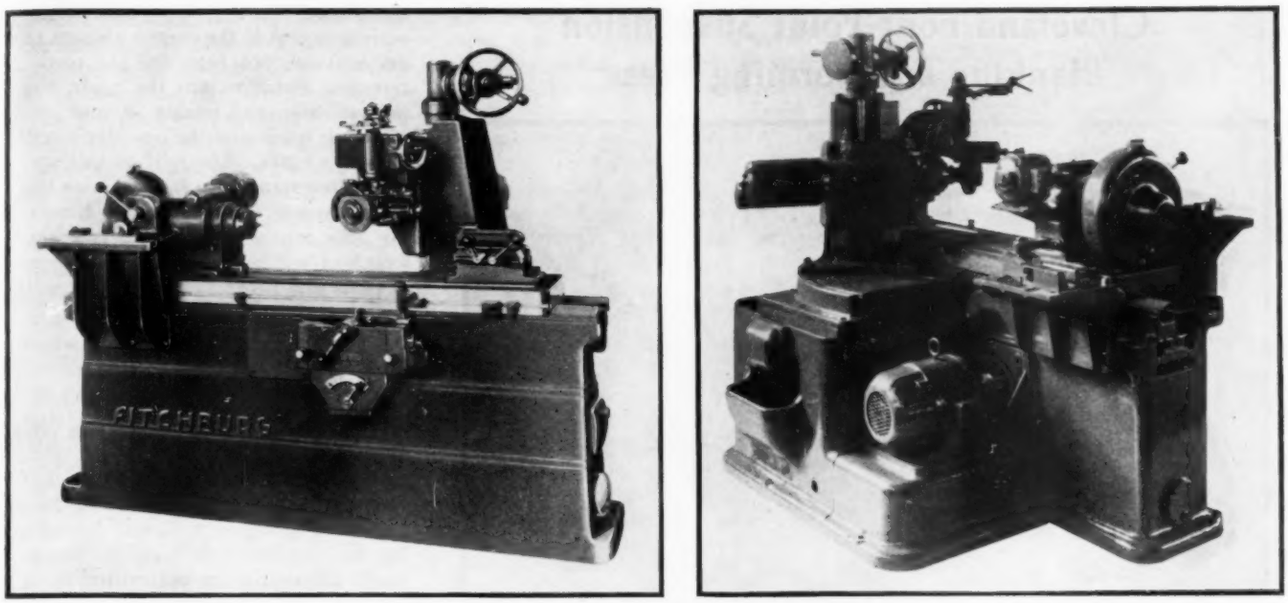
"Mazic" Bright Zinc Plating Process

The Hanson-Van Winkle-Munning Co., Matawan, N. J., has developed the "Mazic" process of bright zinc plating, permitting heavy deposits from a cyanide solution, and giving satisfactory results in still tank, semi-automatic and full-automatic plating systems. The plate is claimed to be truly bright, and to compare favorably with the best cadmium finishes. Solutions are easy to maintain and the high cathode current density permissible in the Mazic solution permits high-speed operation. Only Mazic anodes, made from a special alloy, can be used in the solution.

Bodine Heavy-Duty Worm-Gear Speed Reducer

A heavy-duty speed reducer capable of carrying ¼ hp. loads continuously has been added to the line of the Bodine Electric Co., 2264 W. Ohio St., Chicago, Ill. This reducer is for use with the company's N-5 motors. Eight standard gear ratios from 8:1 to 48:1 are offered, and other ratios can be made to special order. The speed reducer can be mounted in practically any position and the shaft may be extended in either or both directions. Moreover, a high-speed shaft may be brought out from the motor.





Capacity of Fitchburg Spline Shaft Grinder: swing, 14 in.; distance between centers, 20 in.

Fitchburg Spline Shaft Grinder

A machine designed for grinding the sides of keys and the root diameter of spline shafts having either straight or helical splines has been announced by the Fitchburg Grinding Machine Corp., Fitchburg, Mass. The maximum helical rotation the machine will take is 250 deg.; the maximum helical angle, either right or left hand, is 22 deg.

The headstock is motor driven. It is automatically indexed and automatically rotated between indexing for helical grinding. An index plate for the number of splines in question can be furnished. Moreover, there can be had a multiple-key index plate that will take 2, 3, 4, 6, 8 or 12 splines by means of inserts on the index plate.

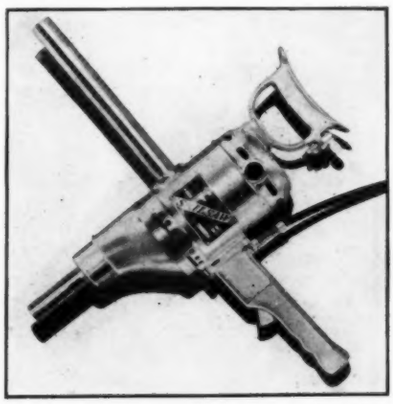
The table is hydraulically traversed with a maximum speed of 30 ft. per minute. All the hydraulic control is built into a panel at the front of the machine. The table-traverse, oil-drive motor is mounted on a separate base and is not connected with the machine so as to prevent the transmission of oil-pump vibration.

The wheelhead contains a ball-bearing spindle and may be either of the integral motor driven or V-belt driven type from a motor mounted on the column. The wheel-feed mechanism is mounted on the wheelhead column and it contains two operating feeds, a slow worm drive motion for grinding wheel feed and a fast traverse for wheelhead positioning. The entire assembly may be swiveled in order to place the handwheel in a convenient position for the operator. A truing device can be furnished for forming what is known as the "W" form wheel on both the sides and root diameter of the shaft to be ground. The footstock is adjustable both horizontally and vertically for alignment with the headstock center.

Skilsaw Portable Electric Drills

Five models have been added to the line of portable drills manufactured by Skilsaw, Inc., 3310-20 Elston Ave., Chicago, Ill. The line now comprises fourteen units in sizes ranging from ¼ in. to ⅞ in. capacity in steel. Of the new sizes, the Model 36 is a $\frac{3}{16}$ in. high-production, ball-bearing electric drill, and the Model 46 is a ¼ in. high-production drill. No load speed of the Model 36 is 3,000 r.p.m. The length over-all is 7½ in., diameter $3\frac{3}{16}$ in. and the weight is 3¾ lb. The Model 46 has a no-load speed of 2,500 r.p.m., the length over-all is 7½ in., the diameter $3\frac{3}{16}$ in., and the weight, 4⅛ lb.

Model 103 is a ⅝-in. heavy-duty, ball-bearing drill with a no-load speed of 450 r.p.m., an over-all length of 19¾ in., and a weight of 25 lb. The Model 123 is a ¾-in. heavy-duty drill with a no-load speed of 375 r.p.m., length over-all of 20¼ in. and a weight of 26 lb. The Model 143 illustrated is a ⅞-in. tool with a no-load speed of 375 r.p.m., length over-all is 20⅝ in., and the weight is 24½ lb.

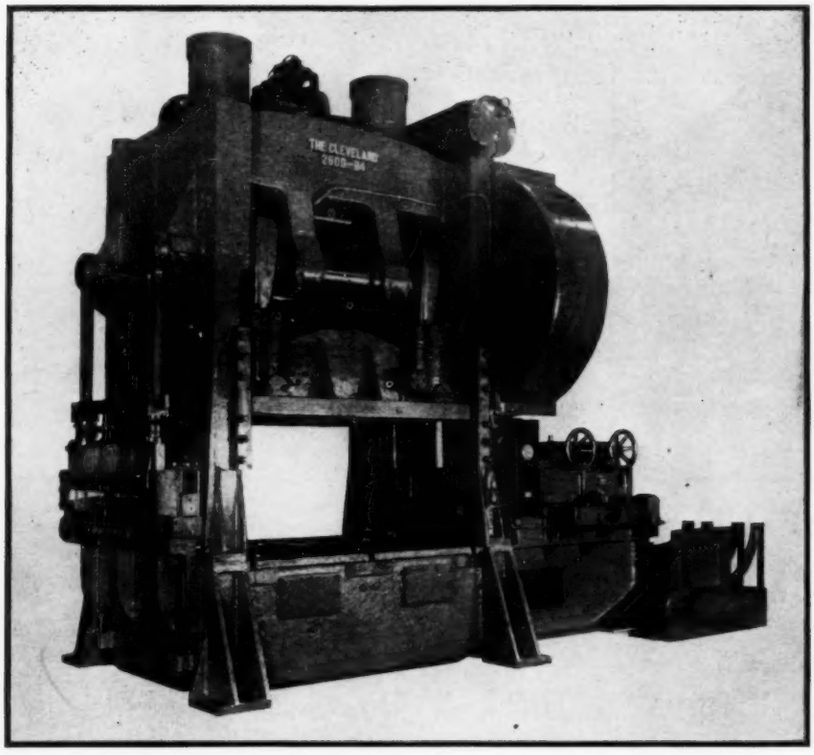


Skilsaw No. 143 heavy-duty drill with capacity of ⅞ in. in steel

Nicholson Improved Files

The Nicholson File Co., Providence, R. I., has announced an improved method of file manufacture and tooth construction now available in the Nicholson, Black Diamond and McCaffrey brands. Regardless of the material, the improved files have demonstrated greater ability to remove stock and to remove it faster. The new method of manufacture and tooth construction makes possible up to three times as many cutting edges to each square inch of the file's cutting surface. Moreover, as the teeth wear down in the natural course, reserve cutting edges come up to take their place, giving the files a new lease of life.

Cleveland Four-Point Suspension Blanking and Forming Press



The Cleveland Punch & Shear Works Co., Cleveland, Ohio, anounces that it can build the four-point suspension press illustrated in any size. Instead of the customary single shaft with but two connections, this press is designed with two shafts having two connections on each, one connection being located at approximately each corner of the slide. This arrangement of the connections, in conjunction with extra long gibs and other features, maintains alignment between the slide and the bed, whether the work is in the center or off center. As a result, there is little possibility of the dies overlapping and not only is the life of the die extended but the work is produced with better accuracy.

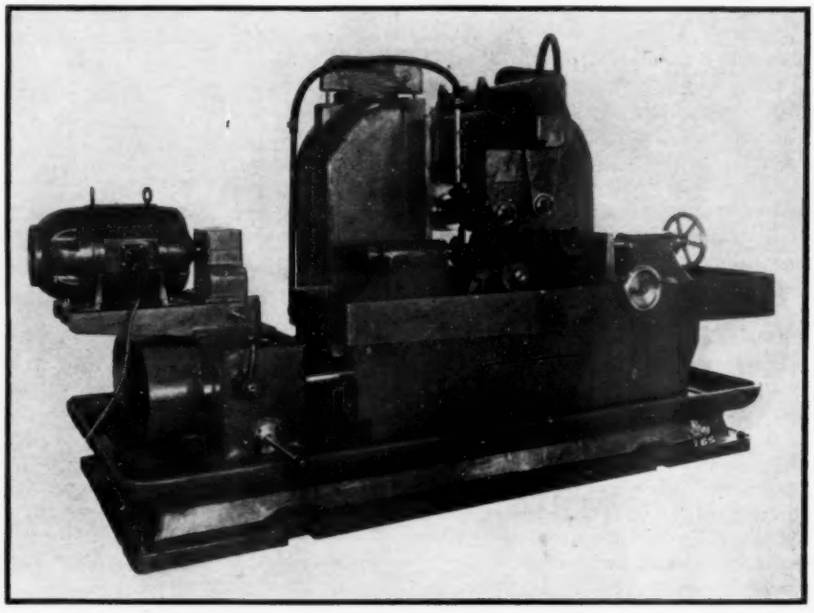
An electrically controlled, air-operated friction clutch and brake are part of the machine. Self-contained pneumatic draw cushions are found in the bed. The slide is air-counterbalanced, and because the air supply for all air-operated units is furnished by a compressor mounted on top of the press, it is independent of the plant air supply.

The press is equiped with a double-roll feed having supplementary rolls for leveling or straightening the material before it reaches the dies, and is also arranged with an automatic uncoiler. A scrap cutter is provided on the opposite side of the press for shearing off the waste after the piece is blanked or formed. The feed arrangement and press operation are synchronized through an interlocking system so that if the correct amount of material has not been fed the predetermined distance into the press, the ram will stop and remain so until correction is made and the operator starts the press again. The rolls on this machine are arranged to feed 6 in. as the minimum and 60 in. as the maximum, but rolls can be furnished to feed any length or width, depending on the size of press and its operation.

Producto-Matic No. 130 Milling Machine

A milling machine incorporating certain standard Producto-Matic principles and new design elements has been furnished by the Producto Machine Co., Bridgeport, Conn., for milling locating spots or pads on crankshafts preparatory to center turning of bearings on production lathes. The work is mounted between centers and an additional equalizing device is used to support and keep the crankshaft in line so as to secure the required finished surfaces.

A double-action movement is required to secure a square bottom or square cut on the finished surfaces. This double movement is secured by vertical movement of the upper and lower spindle arbors as well as a horizontal movement of the table. All movements are controlled and synchronized by cams. There are separate drum cams in each of the columns supporting the cutter spindle bearings, and individual cams mounted within the bed of the machine control the movement of the table.

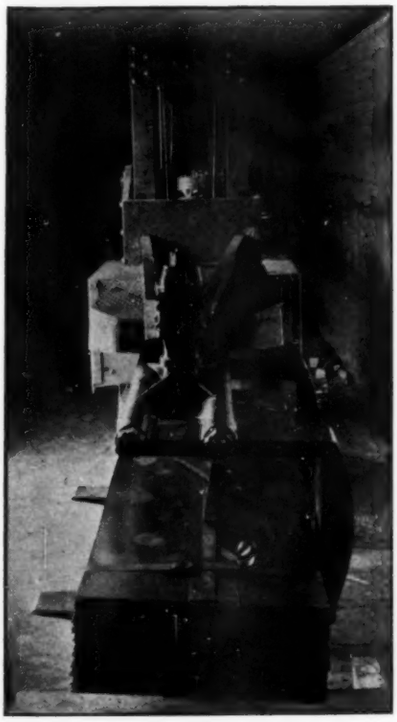


After the work has been located and centralized, the feed lever is thrown and the upper cutter spindle bearing feeds downward and the lower cutter spindle bearing feeds upward. The table then moves horizontally to finish the cut and reverse action takes place to bring the cutters out of the way and the table back to the original milling position. Production is 60 to 65 crankshafts per hour.

The machine is built close to the floor so that the heavy crankshaft can be conveniently handled. To the top of the table the distance is 34 in. and to the center of the head and tail stocks it is 44 in. Overall size of the base is 112x52 in., and the total weight of the machine is 16,000 lb.

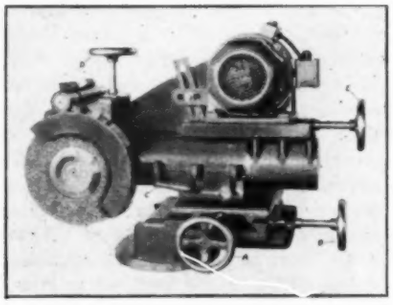
Swivel Fork Attachment For Hy-Lift Truck

The Baker-Raulang Co., Cleveland, Ohio, has developed a swivel fork attachment for the standard 5-ton "Hy-Lift" truck to adapt it to greater use in materials handling throughout the plant and for loading or unloading cars of packaged sheet steel. When applied to the standard 55-in. long platform, one man and the truck can handle steel in bundles up to 3 tons in weight, 30 in. in width, and 96 in. in length. With the packs of sheets loaded crosswise in the railroad car, the forks are slipped under the pack until it is resting completely on the forks. The platform with the forks is then raised a sufficient amount to permit the pack to clear the trailing axles and the underframe of the truck. The forks and load are then swung 90 deg., as shown in the accompanying illustration, so that the pack lies lengthwise of the truck. In this position the pack of steel can be carried out of the car door and into the storage where it can be tiered to any height desired.



Hisey-Wolf Portable Worm Thread Grinder

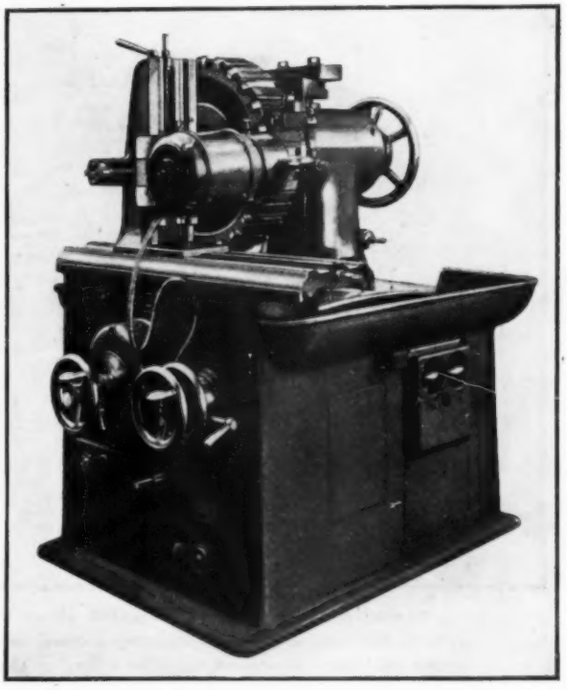
The Hisey-Wolf Machine Co., Cincinnati, Ohio, is now marketing a portable motor-driven, worm-thread grinder. The accompanying illustration shows a side view of the machine with grinding wheel, wheel guard, handwheel *A* for cross-feed adjustment, handwheel *B* for horizontal adjustment, clamp lever *C* for locking the spindle after the grinding wheel has been adjusted to the desired angle, and handwheel *D* for raising and lowering the grinding spindle and handwheel *E* for adjustthe motor. The crank handle *F* affords angular adjustment of the complete grinding head, either to the left or to the right through a worm and worm gear. Through the V-belt drive the correct wheel speed can be furnished. A universal wheel dressing attachment can be had for retruing bevel and straight-face wheels when mounted on either end of the grinding spindle. Three sizes are available, 1, 3 and 5 hp., for any voltage.



Collet & Engelhard Automatic Cutter-Head Grinder

W. A. Schuyler, Fisk Building, 250 West 57th St., New York, N. Y., is distributing in this country the Collet & Engelhard automatic cutter-head grinder made at Offenbach-Main, Germany. The machine is intended for the automatic grinding of all milling cutters and inserted blade cutter heads. It will work on the face, on the side, and on the chamfered edge. Is suitable for inserted square or round inserted teeth, as well as the grinding of involute gear cutters. A spiral attachment for spiral-fluted cutters and a special device for grinding of turning and planing tools can be provided. For grinding high-speed cutting alloys and tungsten carbide tools, the grinding head can be supplied with two speeds, 2,850 and 475 r.p.m.

To compensate for inaccuracy of spacing of the counter blades, each blade is pressed in turn against a stop. Moreover, to insure concentricity and to overcome the effect of wheel wear, the feed per revolution is automatically subdivided into as many single feeds as the cutter is provided with blades. Feed is secured from a spiral cam hav-



ing a spiral lobe on one side and a smaller circular portion adjacent thereto. Adjustment of the feed per revolution is obtained by means of a micrometer screw. Just before the grinding depth is reached, the spiral cam is automatically moved so that the depression of the feed pawl lever becomes smaller and stops when the circular portion of the cam is reached. Thus, at the start of the operation, grinding is done with a coarse feed, but as grinding proceeds the increment of feed becomes smaller until the circular portion of the cam is reached. From this point until the stopping of the feed, only a polishing action occurs.

The machine is made in two sizes. The first design is for cutters from 4 to 16 in. in diameter, and the second for cutters from 6 to 28 in. in diameter.

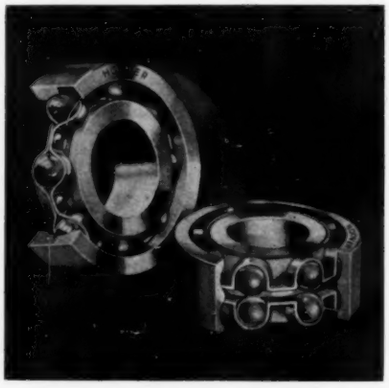
Electrical Head for "Carbo-Lathe"

An electrical head affording a central control for the "Carbo-Lathe" built by the Porter-Cable Machine Co., Syracuse, N. Y., can be installed on either the hydraulic or mechanical machine. This head forms a central control for the entire electrical and pressure systems, and is directly in front of the operator's line of vision. It provides starting and stopping buttons for all motors; pressure gages for either air or hydraulic pressure; direct-reading ammeters to inform the operator of the amount of power being consumed, and enabling him to maintain proper speeds and feeds so as to obtain the maximum efficiency of the machine. These ammeters also warn the operator of any electrical trouble before becoming serious.

Hoover Ball Bearings

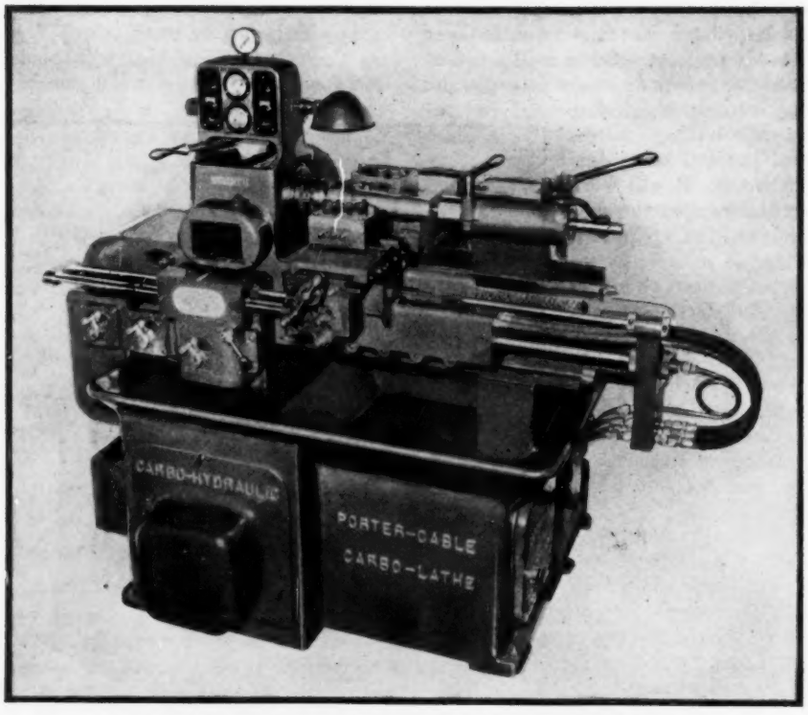
Seventy-five sizes of radial and angular-contact type ball bearings have been added to the line of the Hoover Steel Ball Co., Ann Arbor, Mich. These additions embrace both the single- and double-row types, all of which are made in keeping with the SAE and U. S. Navy Department specifications. Also, numerous special sizes and types of bearings are being added to the line for specific applications in the passenger car, truck and tractor fields.

"Single row bearings" will include all sizes from No. 200 to No. 222 in the light series, No. 301 to No. 318 in the medium series, and No. 404 to No. 410 in the heavy series. "Double row bearings" will include all sizes from No. 5202 to No. 5210 in the light series and No. 5302 to No. 5312 in the medium series. Both single- and double-row bearings will be available with one or two lubricant seal plates, as well as the standard types.

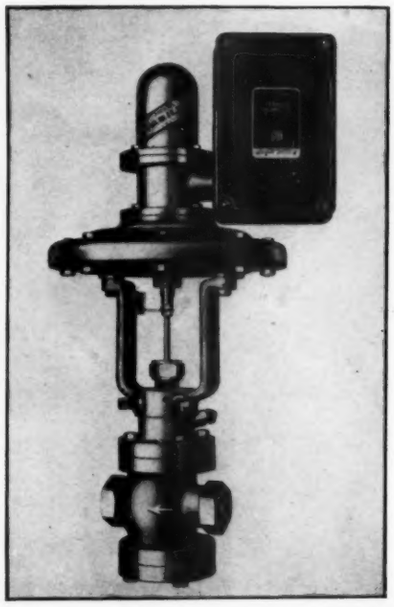


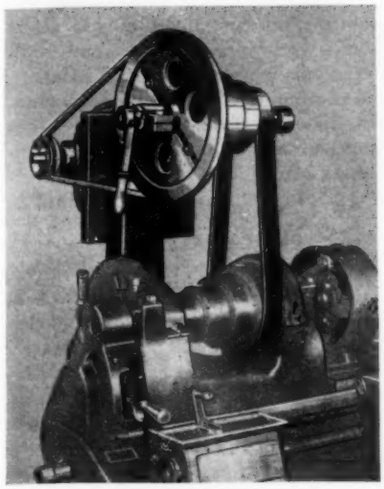
Foxboro Vernier Valvactor

An accessory for air-operated control valves, the Vernier Valvactor announced by the Foxboro Co., Foxboro, Mass., is offered to eliminate valve sticking and to assure hairline valve positioning. This device enables throttling-type air-operated control instruments to make small gradual adjustments of the control valve position regardless of friction or hysteresis. It is claimed that the air from the control instrument need change as little as ½ in. of water to cause a corrective positioning of the valve and to force the stem to take a position within 0.001 in. of the previous one. The Vernier Valvactor can be attached directly to the spring housing of all sizes of "Stabilflo" valves.

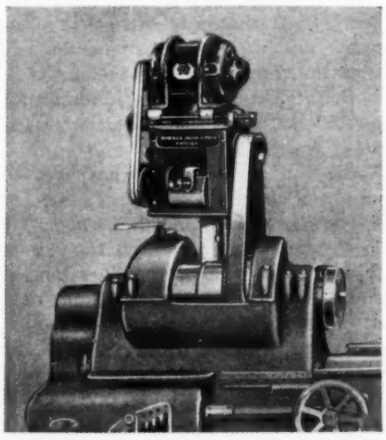


An electrical control panel mounted above the head controls both the main and hydraulic pump motors, and ammeters register the current consumption, to afford a check on the tools





Steege Junior Motor Drive applied to a lathe



Steege Universal Motor Drive with tumbler gearbox applied to a lathe

Steege Motor Drives for Machine Tools

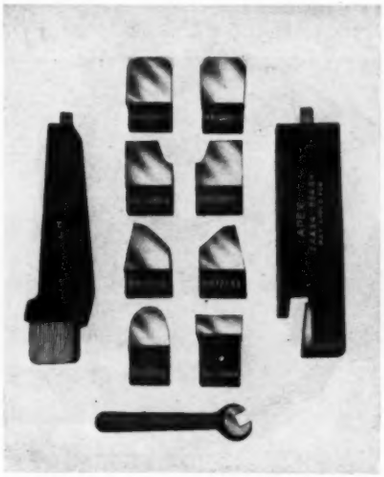
Motor drives for modernizing belt-driven machine tools are being made in several models by the W. L. Steege Machinery Co., 18 South Clinton St., Chicago, Ill. Neither the machine nor its set-up is affected by the drive.

The "Junior" motor drive is made for such machine tools as lathes, milling machines and shapers. The type adapted to a cone-head lathe is shown. It is offered for lathes from 8 to 30 in. swing, and will mount motors from ¾ to 5 hp. In all, five sizes are built for lathe application. Three sizes are made for shaper drives; that is, for machines from 12-16 in. stroke to 20-32 in. stroke. Five sizes are made for milling machines.

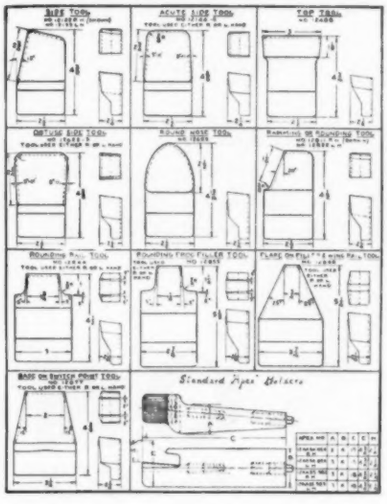
The universal motor drive has a base that fastens to the floor and is tied to the machine with a short cross arm. Power is taken from the motor by a V-belt to the drive shaft of a tumbler gearbox below. Here there are four changes of speed to the single flat-belt pulley at the right. This drive is made in two sizes to deliver from 1 to 2 hp., and from 3 to 5 hp.

Apex Inserted Tools for Frog and Switch Rails

An inserted tool has been developed by the Apex Tool & Cutter Co., Inc., Shelton, Conn., for planing frog and switch rails and crossovers. The holder is made with a hardened seat having milled serrations which mate with serrations on the bottom of the toolbit. When the toolbit is placed in the holder it is locked by means of a double-acting, draw-bolt screw, binding the toolbit securely on the seat of the holder and mating on three sides of the slot.



Sidewise adjustment of the toolbit on the serrated holder compensates for wear. All of the different bits can be used in the one holder

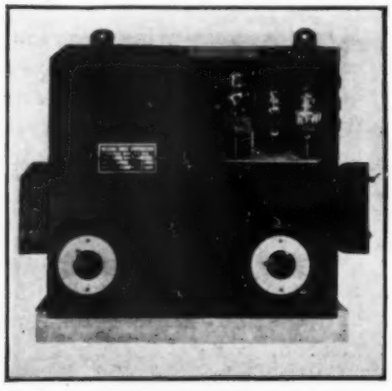


All of the differently shaped toolbits can be used in the holder, without removing the holder from the machine, by releasing the lock at the top of the holder. Toolbits can be adjusted sideways to compensate for wear and a number of the toolbits are made so that they are ground and finished for either right- or left-hand use. This tool is the largest-known inserted tool and is the No. 12 size. The previous largest size made by the Apex Company was No. 9.

The toolbits are made either of high-speed steel or cobalt high-speed steel. All toolbits are ground with 10 deg. front rake and 2 deg. side and bottom clearance. Special formed shapes can also be had for use in standard holders, or special holders are made for other classes of heavy work.

"Welco" Welding Timer

An electro-mechanical timer for spot welding machines has been developed by the Welding Timer Corporation, 251 Ogden St., Newark, N. J. The device consists of an electronic timing element and a set of balanced contactors designed to handle the high overload encountered in spot welding. Timing accuracy of less than one-quarter cycle, plus or minus, is guaranteed at one-cycle operation. At slower speeds, for example between 20 and 30 cycles, any reasonable accuracy can be assured to 2 per cent, plus or minus. Standard settings range from one cycle as a minimum to 30 cycles as a maximum. Timers are made in standard sizes for 30, 50, 150, 250 and 600 amp., which covers practically all spot welding requirements.



Improvements

Improvements in steel making are indicated by such tensile strengths as 400,000 lb. for a special grade of piano wire and up to 310,000 lb. for certain alloy steels properly heat-treated.

NEW BOOKS

PRACTICAL SHOP MATHEMATICS, VOL. II—ADVANCED *By John H. Wolfe, supervisor of apprentice school, Ford Motor Company and Everett R. Phelps, associate professor of physics, Wayne University. 296 pages, 5x7 in. Indexed and illustrated. Clothbound binding. Published by the McGraw-Hill Book Company, 330 West 42 Street, New York, N. Y. Price $2.20.*

As in the case of Volume I (*AM*—Vol. 80, page 22) this book is a revision of material compiled in loose leaf form for a course in shop mathematics at the Ford Apprentice School. An understanding of fractions, decimals, geometry and plane trigonometry, as covered in Volume I, is essential to a student taking up Volume II.

The authors include explanations and problems on compound angles, screw threads, gears, gear ratios and leadscrews, plain and differential indexing, and combining and continued fractions. Throughout the subjects are approached simply and practically, reflecting Mr. Wolfe's seventeen years' experience in teaching shop mathematics.

THE ELEMENTS OF MOTOR VEHICLE DESIGN—*Second Edition—By C. T. B. Donkin, late lecturer in motor car engineering at the Borough Polytechnic Institute. 289 pages, 5½x8½ in. Indexed and illustrated. Cloth board binding. Published by Oxford University Press, London, England. Price, $4.25.*

The second edition brings up-to-date material which appeared originally in 1926. Since that date changes in automobile design have been numerous, but since the purpose of this volume is to show the application of fundamental laws of mechanics the general approach is the same.

The aim of the author has been to supply a practical working guide for designers, students and draftsmen. He does not offer an advanced treatise on automotive design but confines himself to basic principles, presupposing only an elementary knowledge of mechanics, mathematics and the functions of the various components of an automobile.

New material in the second edition includes rewritten chapters on gears and brakes, and a considerable amount of additional explanatory matter.

ALTERNATING CURRENT MACHINERY—*By John M. Bryant, professor of electrical engineering and Elmer W. Johnson, associate professor of electrical power engineering, University of Minnesota. 790 pages, 5¾x9 in. Indexed and illustrated. Published by the McGraw-Hill Book Company, 330 W. 42d St., New York, N. Y. Price $6.*

From mimeographed notes and problems collected by the authors during many years of teaching at three universities, this volume was written.

The subject matter includes theoretical and practical treatment of transformers, synchronous machines, induction machines, synchronous converters, commutator-type a.c. motors and mercury arc rectifiers. Following textbook style, problems and bibliography follow each chapter. Illustrations cover circuit connections, vector diagrams and halftones of machines.

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